National Engineers Week

Future City COMPETITION

Educator Handbook

2011–2012

The Future City Competition is a national project-based learning experience for students in 6th, 7th, and 8th grades to imagine, design, and build cities of the future.

www.futurecity.org

Future City is a program of the National Engineers Week Foundation

Dear Educators,

Welcome to the National Engineers Week Future City® Competition! Over the next several months you'll lead your students through a rewarding learning experience where they will tackle real issues affecting real people. Along the way they will discover engineering, become more aware citizens, and build their confidence.

You have joined a program where thousands of volunteers share their time, expertise, and enthusiasm to encourage our young people to explore the world of engineering. Begun in 1992, the Future City Competition is part of the rich history of the National Engineers Week Foundation.

We are proud to sponsor a program that provides students in 6th, 7th, and 8th grades the opportunity to:

- participate in an authentic, project-based learning experience
- strengthen their 21st century skills (problem-solving, teamwork, citizenship, public speaking, and time management)
- build a meaningful relationship with a STEM mentor
- explore engineering, its various disciplines, and potential engineering careers
- learn about the engineering design process
- gain an understanding of engineering's various contributions to society
- see the value of studying math, science, engineering, and technology

Thank you for joining us. If you have any questions, please contact your Regional Coordinator or the National Office.

Sincerely,

Leslie Collins

Leslie Collins
Executive Director
National Engineers Week Foundation

Table of Contents

Introduction 2
- What is Future City? 2
- Program Resources 4

Explore Engineering 6
- What is an Engineer? 6
- Engineering Design Process 7
- Engineering Careers 8

Getting Started 9
- Timeline 10
- Home School Affidavit Form 11

Design the Virtual City 12
- Rubric 15
- Virtual City Benchmark Form 19

Write the Research Essay 21
- Resources 26
- Rubric 27
- Research Essay Form 30

Write the City Narrative 31
- Rubric 33
- City Narrative Form 34

Build the Model 35
- Rubric 38
- Competition Expense Form 41

Team Presentation 43
- Rubric 46
- Honor Statement Form 48
- Media Waiver Form 49

Competition Rules 50
- Scoring Deductions 52

Prizes and Awards 53
- National Special Awards 54

Certificates 60

Appendix 62
- National Standards 63
- Regional Coordinators 72

Contact Information

The National Engineers Week Future City® Competition Staff
1420 King Street
Alexandria, VA 22314
Toll Free: 1-877-636-9578
info@futurecity.org

Our web site has been completely updated and redesigned. Visit www.futurecity.org for a customized calendar, Future City showcase, writeable PDF competition forms, and more!

Introduction

What is Future City?

Across the nation, teams of middle school students work with educators and engineer mentors to build cities of the future. Student teams plan cities with SimCity™ 4 Deluxe software; build tabletop scale models with recycled materials; research and write solutions to an engineering problem; and present their ideas before judges at Regional Competitions in January. Regional winners represent their region at the National Finals in Washington, DC in February.

Future City At-A-Glance		SEPT	OCT	NOV	DEC	JAN	FEB
1. Get Started	Register online, receive program materials, form student team(s), recruit engineer mentor.						
2. Design Your City	Plan a city of the future using SimCity™ 4 Deluxe software.						
3. Write Research Essay	Research and write an essay on engineering a solution to a pressing social need.						
4. Build City Model	Build a scale model using recycled materials.						
5. Write Narrative	Describe your city and key design attributes.						
6. Present Your City	Show your city to a panel of judges at your regional competition.						
7. National Finals	Regional winners compete at Finals in Washington, DC.						

Dates in regions may vary. Check regional web site for specific dates.

Future City engages kids in engineering and so much more….

This flexible, cross-curricular educational program gives students in 6th, 7th, and 8th grades an opportunity to do the things that engineers do—identify problems; brainstorm ideas; design solutions; test, retest and build; and share their results. This process is called the engineering design process. With this at its center, Future City is an engaging way to build students' 21st century skills. Students participating in Future City:

- Apply math and science concepts to real-world issues
- Develop writing, public speaking, problem solving, and time management skills
- Research and propose solutions to engineering challenges
- Discover different types of engineering and explore career options
- Learn how their communities work and become better citizens
- Develop strong teamwork skills

> " I like the cross-curricular approach—computer applications for technology; city planning for social studies; budgeting for math; model building for art and math; research, writing, and presentation for language arts."
>
> – **Kathy Neuenschwander, Indiana Teacher**

How does the Competition work?

The Future City Competition is made up of five components. Teams are judged and scored on each of the five components and can earn up to 400 points.

Virtual City Design	100 points
Research Essay	70 points
City Narrative	20 points
Physical Model	120 points
Team Presentation	90 points
Total	**400 points**

The Virtual City Design, Research Essay, and City Narrative are all due before the Regional Competition. The Model and Team Presentation are judged at the Regional Competition. At Regionals, scores from all five components will be added together to determine the top team. The 1st place team in each region will advance to the National Finals held in Washington, DC. (Note: Airfare, hotel accommodations, and a number of meals are paid for by the Future City Competition.) National Finals will be February 17–22, 2012.

Can I still do Future City without competing?

Yes! Future City is first and foremost a Science, Technology, Engineering, and Math (STEM) program. Educators, parents, and mentors are encouraged to adapt Future City to match their individual educational goals. Over the years, educators and engineers have used the Virtual City Design to teach city planning; the Essay to strengthen research and writing skills; and the Physical Model to understand scale, potential and kinetic energy, and city planning.

Future City is aligned with the National Standards. See pages 62 to 71.

Program Resources

Participants who register receive everything they need to successfully implement Future City, including:

SimCity™ 4 Deluxe Software

Teams will design their virtual city of the future using this software. While they are designing, students will explore city planning, economics, sustainability, waste management, and other topics related to engineering.

The Educator Handbook

This how-to handbook (also downloadable at www.futurecity.org) provides an overview of the program, a step-by-step guide for each component, assessment rubrics, competition forms, and the competition rules.

The Web Site

Completely updated and redesigned, **www.futurecity.org** is your online destination for:

- *Customized Calendar*—keep track of important program dates and regional events
- *Future City Showcase*—see examples of winning entries and get inspired
- *Competition Forms*—download writeable PDF versions of all competition forms
- *National Standards*—learn how Future City aligns with national educational standards
- *Frequently Asked Questions*—get answers to your questions from experienced educators, mentors, and regional coordinators
- *Competition Checklist*—track your team's progress and what's coming up next
- And so much more!

NEW! Learning Blocks

Our new online Learning Blocks are another great resource you can use to underpin Future City's key concepts, or use independently of the competition. There are four different Learning Blocks—City Planning: Zoning and Infrastructure; SimCity: Understanding the Game; Model Building Concepts; and Model Construction.

Each Learning Block includes:

- Hands-on Activities
- Background Information
- Key Terms & Concepts
- Links to National Standards
- Additional Resources

Check out the *Learning Blocks* at **www.futurecity.org/learningblocks**

" Future City is a great program for middle school students. I am convinced that this is one of the best exercises for students to experience problem based learning, collaboration, creativity, and use STEM skills, all for a minimal entry fee."

– Jennifer Hoffman, Nebraska Teacher

Engineer Mentor

Serving as the team advisor for all phases of the program, the mentor provides valuable input and technical assistance. The mentor makes connections to real life engineering experiences, serves as a coach, and helps students translate the academic to the real world of engineering. While a person who works in the engineering community is preferred, any technical professional can serve as a mentor. If you don't have a mentor, your Regional Coordinator will try and find a volunteer for you. Go to **www.futurecity.org** and click on *Find My Region* to contact your Regional Coordinator.

Regional Competition

Registered teams may compete in their Regional Competition. If a region does not exist in your area, please contact the National Program Manager at info@futurecity.org.

Technical Support

Each Future City Region provides additional resources and trainings. Volunteers are available to answer your program questions, from "How do I register?" to "How can I find an engineer mentor?". To find your region, visit **www.futurecity.org** and click on *Find My Region*.

" I told them Future City is more than just an extracurricular activity, it's a path to a rewarding engineering career."

– Lauren Blas, Western NY Alumni

Register Today!
If you haven't already done so, register at **www.futurecity.org/register**
Registration costs just $25.00 per school.

Explore Engineering

Few students can describe what engineering is or what an engineer does. Yet once they discover it they are hooked. As you work with your students, use the information in this section to talk to them about engineering.

Invite students to learn more from real engineers through the following activities:

1. Have your students interview different types of engineers and share what they learn with their teammates.
2. See engineers in action. Arrange a field trip to an engineer's office, power plant, water treatment center, local engineering college or university, city planner/ engineer office, and other engineering-related workplaces.
3. Invite your engineer mentor and other professionals to talk to the students about science, engineering, and technology careers. Encourage your students to prepare questions and interview the speaker.

What is an Engineer?

Engineers are changing the world all the time. They dream up creative, practical solutions and work with teams of smart, inspiring people to invent, design, and create things that matter. They are team players with independent minds who ask: *"How can we develop a better recycling system to protect the environment; how can we design a school that can withstand an earthquake: or how can we create cutting-edge special effects for the movies?"*

Who makes a good engineer?

There is no one "type" of person who becomes an engineer. Engineers are. . .

- creative
- like collaborating with others
- are curious and persistent
- want to make a difference
- like solving problems or improving processes

"I didn't know there were so many types of engineers."

– Ben P., Chicago Team Member

The Engineering Design Process

Engineers use the engineering design process to arrive at a solution. The following description is a guide—engineers do not necessarily follow it step-by-step. It is a cyclical process where you can begin at any step, or move back and forth between steps numerous times. The engineering design process is a great way to work through any challenge that involves creating something that did not exist before, such as making breakfast, planning a trip and—especially designing a city of the future.

Identify the Problem

Are you trying to:

- fix something that does not work?
- make something better?
- create something that's not being done at all (wouldn't it be great if…)?

Learn the Specs

Engineers have to work with project requirements or constraints. Before you start any project, understanding the specs will save you lots of time and will help determine the solution. Ask questions about:

- Physical constraints. (size, weight, environment, materials)
- Who or what is the user? What do they need?
- Who is the customer? What do they want?
- What will it cost? What is the budget?

Brainstorm Solutions

Come up with as many possible solutions as you can. Then ask:

- How well do these ideas meet some or all of the requirements?
- What trade-offs can you make?

Design It

- Which idea do you think is really possible?
- What problems do you need to solve for your solution to work?
- Develop a plan.
- Make a sketch of your solution.
- Make lists of materials and resources you will need.
- Research answers to questions.

Test It and Improve It

- Test your solutions using computer simulations and scale models.
- Decide what works, what doesn't work, and what could work better.
- Modify your design.
- Test it again.

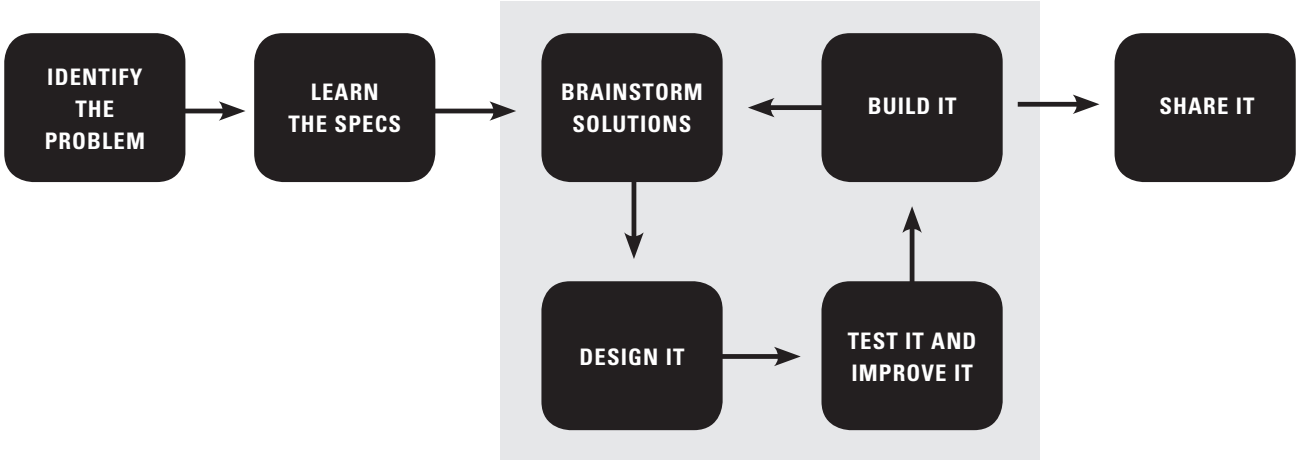
Build It

- Assess your design—is it the best it can be?
- Follow your plan and create it.
- Once you complete the "Build It" stage, you can go back and start the process over again to refine your solution or respond to changing requirements.

Share It

Presenting your work to others is a great way to get feedback on your solution.

THE ENGINEERING DESIGN PROCESS



Engineering Careers

What makes engineering a great career? Read on…

Ten Reasons to Love Engineering*

1. **Love your work, AND live your life too!**
   Engineering is an exciting profession, but one of its greatest advantages is that it will leave you time for all the other things in your life that you love!
2. **Be creative**
   Engineering is a great outlet for the imagination—the perfect field for independent thinkers.
3. **Work with great people**
   Engineering takes teamwork, and you'll work with all kinds of people inside and outside the field.
4. **Solve problems that matter**
   Come up with solutions no one else has thought of. Make your mark on the world.
5. **Never be bored**
   Creative problem solving will take you into uncharted territory, and the ideas of your colleagues will expose you to different ways of thinking.
6. **Make a big salary**
   Engineers not only earn lots of respect, but they're highly paid. Even the starting salary for an entry-level job is impressive!
7. **Enjoy job flexibility**
   An engineering degree offers you lots of freedom in finding your dream job. It can be a launching pad for jobs in business, design, medicine, law, and government.
8. **Travel**
   Field work is a big part of engineering. You may end up designing a skyscraper in London or developing safe drinking-water systems in Asia. Or you may stay closer to home, working with a nearby high-tech company or hospital.
9. **Make a difference**
   Everywhere you look you'll see examples of engineering having a positive effect on everyday life.
10. **Change the world**
    In very real and concrete ways, engineers save lives, prevent disease, reduce poverty, and protect our planet.

*This information is used with permission from *Engineer Your Life.*

Engineering Jobs

As an engineer, here are just a few of the jobs you could be doing:

- Develop rockets that collect comet samples
- Create satellites that detect drought around the world
- Design environmentally friendly cleaning products
- Develop chemotherapy that has fewer side effects
- Monitor the quality of a city's water supply
- Ensure that a school can withstand an earthquake
- Create special effects for the movies
- Design artificial retinas for the blind
- Develop state-of-the-art cell phones
- Develop better methods of recycling plastic
- Create ways of restoring wetlands
- Design ergonomic office space
- Ensure worker safety in factories with dangerous equipment
- Design a lighter bike frame
- Produce biodegradable plastics
- Invent clothing that repels mosquitoes
- Design smart toys for kids
- Create more fuel-efficient cars
- Design instruments that can map the ocean floor

Learn More

To discover more about careers in engineering, visit:

- **eweek.org**
- **discoverengineering.org**
- **engineeryourlife.org**
- **pbs.org/designsquad**
- **tryengineering.org**
- **asceville.org**
- **nasa.gov**

Getting Started

Remember this is a **student-based program.** While educators, parents, and engineer mentors can advise, the student teams are completing the work.

Organizing Your Students

Future City is open to students in 6th, 7th, and 8th grades who are from the same school or from a home school environment*. Every registered school is eligible to participate at the regional level. Students can work together in a variety of team formats (see below). However, at the Regional Competitions and National Finals, a "team" is defined as the three presenting students, the educator, and the mentor.

Home School Affidavit*

If you are a home school, you will need to complete the Home School Affidavit Form to verify that your home school is operating in accordance with the laws in your state. The form can be found on page 11, or you can download it at www.futurecity.org/forms.

There are many ways to form a team:

1. **Single Team from One School or Classroom (Three students)**
   - Select three student team members.
   - Meet with students to discuss the overall program.
   - Recruit an engineer mentor and coordinate a schedule.

2. **Multiple Teams from One School or Classroom (Multiple groups of three students)** Check with your Regional Coordinator for the maximum number of teams each school can bring to the Regional Competition. NOTE: Only one team from each top scoring school can advance to the final round of the Regional Competition.
   - Meet with all of your students to discuss the overall program.
   - Organize the teams. Students can self-select or you can assign teams.
   - Recruit an engineer mentor and coordinate a schedule. It is recommended that each team have an engineer mentor for guidance, but one engineer can serve as a mentor for several teams.

3. **Large Group or Classroom Effort (More than three students working together)**
   - Meet with all of your students to discuss the overall program and explain that it will be a group effort to complete the project.
   - Organize students into working groups. Students can either self-select or you can assign them to a working group. You can organize groups around different program components (e.g., the virtual city design group, the research essay group, etc.).
   - Identify three presenters. These three students will be the "official student presenters" at both the Regional and National Competitions and need to be registered as such.
   - Recruit your engineer mentor and coordinate a schedule with him/her. When selecting an engineer mentor, remember to tell him/her that they will be working with many different students throughout the course of the event. You may also want to recruit several engineer mentors so you have one mentor per group.

Once you've determined your team formats, go to **www.futurecity.org/register** and enter your team details. Students who are not officially registered cannot compete.

The Role of the Engineer Mentor

The mentor serves as an advisor and can provide input and technical assistance in all phases of the program. Mentoring is about advising, teaching, coaching, and providing a guidance system. By tying in real-life engineering experiences, the mentor can help the students connect the academic to the real world of engineering. Keep in mind that the students must do all the actual work—the mentor is simply an advisor.

Finding a Mentor—Mentors can be engineers, technical professionals, or others who work in the engineering community. If you need help finding a mentor, please contact your Regional Coordinator.

Visit **www.futurecity.org** and click on *Find My Region* for your Coordinator's contact information.

The Future City Timeline

The Future City Competition is made up of five components:

- Design a virtual city
- Write a research essay
- Build a physical model
- Write a city narrative
- Team presentation

> " Working as a team was one of my favorite parts"
>
> **– Abhinaya G., Iowa Student Team Member**

Here is a general timeline to help you begin your planning:

SEPTEMBER – OCTOBER

1. Decide your Future City team format. (See page 9 for team options.)

2. Go to **www.futurecity.org/registration** and enter your team(s) information.

3. Meet with your team(s) and introduce the program and its five components.

4. Recruit and coordinate with your engineer mentor.

5. Check **www.futurecity.org** for any regional or national trainings (e.g., how to use SimCity; essay development; model building tips, etc.)

6. Introduce students to SimCity™ 4 Deluxe and begin to plan and design your Virtual City.

7. Begin researching, outlining, and creating the rough draft of the Essay (1000 word maximum).

8. Start gathering recyclable materials for the physical model(s).

OCTOBER – DECEMBER

1. Continue to design your virtual city.

2. Start building the scale model of your city.

a. Decide what portion of the city you will build.

b. Decide the scale of your model.

3. Finish researching and writing the essay.

4. Finish and submit the Virtual City Design. (Check with your Regional Coordinator or online for specific due date.)

5. Write the City Narrative describing your city of the future (500 word maximum).

6. Submit the Research Essay and City Narrative to your Regional Coordinator. (Check with your Regional Coordinator or online for specific due dates.)

7. Celebrate achievement of milestones and evaluate progress to date.

DECEMBER – JANUARY

1. Develop and practice the presentation.

2. Continue to work on the physical model.

3. Compete in your regional Future City Competition. Check with your Regional Coordinator or online for the date of the Regional Final.

4. Celebrate achievements. Present certificates of participation found on page 60.

FEBRUARY

1. Regional winners advance to the Future City Competition National Finals in Washington, DC from February 17–22, 2012.

Download a writeable PDF version
of this form at **www.futurecity.org/forms.**

Home School Affidavit

I verify that (Print the names of students participating in the competition)

1. _____

2. _____

3. _____

are currently enrolled in the 6th, 7th or 8th grade at a home school in (state) _____.

Further, I verify that the home school attended by the above named students is in compliance

with all home school laws in (state) _____.

_____

Signature of Home School Administrator Date

Action Item for Home School Administrator:

Mail or email the signed form back to your Future City Regional Coordinator no later than November 1, 2011.

Locate your Regional Coordinator's contact information at **www.futurecity.org** under *Find My Region.*

Design the Virtual City

Scoring: **Up to 100 points**

Schedule:
September to November*

Students will spend approximately **18–20 hours** designing their cities.

*Dates may vary. Check futurecity.org for specific dates.

Students use SimCity™ 4 Deluxe software to design a virtual city that has progressed at least 150 years in the future and has a population of at least 50,000 residents.

Learning Outcomes

Students will be able to:

- Identify basic city services and features (such as emergency services, transportation, and education)
- Identify areas of zoning and the services that comprise city infrastructure (commercial, residential, and industrial)
- Explain the importance of city location, placement of city features, and proportions in zoning

How do I get SimCity™ 4 Deluxe?

Schools that are registered in Future City will receive one copy of the software (after August 1, 2011) in either a PC or MAC format. Additional copies can be purchased for a small shipping and handling fee after September 1, 2011. Simply go to the Step-By-Step Guide at www.futurecity.org and click on Design the Virtual City.

Getting Started with SimCity™ 4 Deluxe

All competing teams must design their city in the pre-designed medium region. You can download this at **www.futurecity.org** from the *Resources* section. Please note: Cities must be started from scratch each year. For questions about the software, start with the SimCity User's Manual. A copy of this manual as well as a number of tutorials, videos, and other helpful resources are available in the *Resources* section of **www.futurecity.org.**

Technical support is available from your Regional Coordinator and from Electronic Arts at **www.simcity.ea.com** or by phone at the Electronic Arts support line **1-650-572-2810.**

Guide Students' Thinking

One way to determine what to build, where to build, and how much to build is to list all the possible requirements a city's citizens might have. As your students work through this step, use these questions to help students design a city that is well planned and meets competition requirements.

1. How will you layout your city? What kinds of industrial, commercial, and residential areas will you build? Where will you build them?
2. What kinds of parks and recreation areas will be in your city?
3. How will your city pay for infrastructure and basic services?
4. What services (police, fire, medical, education) will your city provide? Where will you place them?
5. How will you provide power to all areas of your city?
6. How will your city design incorporate the Fuel Your Future essay topic?
7. Do you have renewable energy sources?
8. How will you make sure all areas of your city have water?
9. How will your city dispose of waste and recycle?
10. How will you manage pollution (water and air) in your city?
11. What types of transportation will be available to move citizens and goods?
12. As you design your city, how could you use the engineering design process to help you work through problems (define the problem to solve; brainstorm various solutions; select a solution; design, build, test and redesign solution; share results)?

Tips

Consult with your school's IT department early in the process to work through any issues that may arise when installing the SimCity software. Note: SimCity does not require a licensing agreement. Organizations may load the software on a number of computers. However, the simulation only runs when the play disc is inserted in a computer loaded with the SimCity software.

Give students several sessions to get comfortable with SimCity before they start designing in earnest. Encourage them to explore the toolbar and learn what each button does. But warn them to stay away from the "God Mode" button as it can easily destroy the city.

Build slowly and wisely. Designing a SimCity is a balancing act between income and expenses for building infrastructure. Don't build more than you can afford.

Remember that SimCity is not a one-time build. Students can easily restart; just make sure to keep a copy of the "clean" basic city. Let students re-do the city as many times as they want—this allows them to explore the interactions and learn intuitively.

Keep ethics in mind. Cheat codes or shortcuts are not allowed. Review the Honor Statement Form on page 48 as a team.

Learning Blocks

CITY PLANNING

This Learning Block offers four activities you can use to introduce students to city planning terminology. At the completion of the activities, students should be able to identify and define areas of zoning and the services that comprise city infrastructure. They should also be able to explain the interrelationships between these city elements as well as understand the importance of city location, placement of city features, and proportions in city zoning.

SIMCITY—UNDERSTANDING THE GAME

Looking for activities and ideas on how to teach your students SimCity strategies? This Learning Block helps students form city planning teams and explore the SimCity tutorials to learn basic strategies. At the end of the Learning Block, students will be able to create and run a successful city in SimCity 4. The Learning Block also ties in real-life lessons such as budget management, land use planning, roles of government officials, and working with data.

Check out the Learning Blocks online at **www.futurecity.org/learningblocks**

Downloading the Medium City Region on PC's

Note: You can download the medium region and SimCity 4 to a number of computers. However, to run the simulation you must insert the play disc.

1. **Copy** the Starter Region zip file "Medium City.zip" to your My Documents folder (or in Windows Vista Documents folder) on to your primary computer.
2. **Decompress** the zip file by double-clicking the file name.

- If you have Windows Compression turned on, it will open it up like a folder. On the left hand pane, select "Extract Files" and it should extract it to My Documents folder.
- If you have a zip utility (such as WinZip or PKZip) installed, please follow that programs extraction instructions.

3. **Locate** the "Medium City" on your computer.
4. **Copy** the folder to the My Documents\SimCity 4\Regions directory for the user you plan to play SimCity 4. You should end up with the following directory: Medium Sized City – My Documents\SimCity 4\Regions\Medium City.
5. **Start** SimCity™ 4. When you reach the region view, select Load Region. Then select "Medium City" Region.
6. Your region should look like:

7. **Name** your city. Note: The city name needs to remain consistent throughout the competition.
8. **Start** your new city on the square in the center of the existing city. It is labeled "Design Medium City Here".
9. You can delete and create a new city if you are unhappy with your existing city.
10. **Back up** your city by navigating to the appropriate region folder and copy it to another directory on your computer.

Go to **www.futurecity.org/stepbystep** to see more tips, common challenges, and FAQ's under *Design the Virtual City.*

Check Progress

The Virtual City Benchmark Form is a required and useful tool for students to make sure that they have met all of the required design elements (and it's an easy 10 points). You can find this form on page 19 or download the writeable PDF at **www.futurecity.org/forms.** *Please remember, the educator or mentor must sign the form to attest to its accuracy.*

Virtual City Design Rubric—Have students review the rubric on the next few pages and evaluate their city design the same way the judges do.

If your school has multiple teams, have them present their city designs to each other and discuss their city performance and how they achieved their results. This is a great way to receive feedback and learn new ideas.

Competition Checklist

- ◯ Use the **pre-designed medium region** SimCity template. Download at **www.futurecity.org/resources.**
- ◯ Make sure the city has progressed at least 150 years into the future and has a population of at least 50,000.
- ◯ Select a meaningful and unique name for your city. The city name will go on all the forms and files you submit to the Regional Coordinator and cannot change during the course of the program.
- ◯ Complete and submit the *Virtual City Benchmark Form.*
- ◯ Submit your *Virtual City.*

For submission details and deadlines go to **www.futurecity.org** and click on *Find My Region.*

> " The competition has given me confidence and the knowledge that as a girl, I can contribute just as much as the boys on the team.
>
> **Rachel L., Texas Student Team Member**

Competition Scoring

Teams can earn up to 100 points for their Virtual City. Make sure students have thoroughly covered all six categories to maximize points:

City Management	12 points
City Layout	21 points
City Services	18 points
Energy & Pollution	18 points
Transportation	21 points
Benchmark Form	10 points
Total	**100 points**

Scoring Deductions

5–10 points Missing the submission deadline for the Virtual City Benchmark Form and/or the Virtual City Design (SimCity).

15 points Be sure to design the Virtual City in the pre-designed medium region.

2 points Information missing from the Virtual City Benchmark Form.

Virtual City Design Rubric

0	1	2	3
No Points Requirements missing	**Poor** Poor-Fair quality. Fulfills less than 50% of requirements.	**Good** Average-Above average quality. Fulfills at least 90% of requirements.	**Excellent** Excellent quality. Fulfills 100% of requirements. Additional distinctive features.

I. CITY MANAGEMENT CRITERIA (12 POINTS)	0	1	2	3
1. City age • At least 150 years	Age ≤ 10 years.	Age ≤ 100 years.	Age ≤ 150 years.	Age > 150 years
2. City population • At least 50,000	Population ≤ 5,000.	Population ≤ 25,000.	Population ≤ 50,000.	Population > 50,000.
3. Budget management • Income > expenses • Well-managed budget • Performance over time	Unbalanced budget.	Balanced < 25% of time.	Balanced < 75% of time.	Balanced > 75% of time.
4. Mayor performance • Opinion polls • Mayor rating	Impeach! < 3 polls green. Mayor rating < 20 (avg for 10 yrs). Data view red to dark green.	> 3 polls green. Avg mayor rating > 20. Data view dark green to green.	> 4 polls green. Avg. mayor rating > 50. Data view green.	All polls green. Avg. mayor rating > 60. Data view green.
II. CITY LAYOUT CRITERIA (21 POINTS)	**0**	**1**	**2**	**3**
5. Residential development • R § (low wealth) • R §§ (medium wealth) • R §§§ (high wealth)	No development.	One level of residential development.	Two levels of residential development.	All three levels of residential development.
6. Industrial development • I-Ag (agriculture) • I-D (dirty industry) • I-M (manufacturing) • I-HT (high-tech)	No industrial jobs.	Jobs in 1-2 industry segments.	Jobs in 3 industry segments.	Jobs in all 4 industry segments.
7. Greener, cleaner industry • Employment shifting from I-D (dirty) to I-M and I-HT	Few manufacturing or high-tech jobs (less than 25%).	25-50% of industrial jobs are in manufacturing or high-tech.	50-75% of industrial jobs are in manufacturing or high-tech.	More than 75% of industrial jobs are in manufacturing or high-tech.

8. Commercial development
• Commercial Service
  • Cs § (low wealth)
  • Cs §§ (medium wealth)
  • Cs §§§ (high wealth)
• Commercial Office
  • Co §§ (medium wealth)
  • Co §§§ (high wealth)
	No commercial jobs.	Jobs in commercial service segments only.	Jobs in commercial service and office segments.	Jobs in all 5 commercial segments.

CONTINUED ON NEXT PAGE

Virtual City Design Rubric

0	1	2	3
No Points Requirements missing	**Poor** Poor-Fair quality. Fulfills less than 50% of requirements.	**Good** Average-Above average quality. Fulfills at least 90% of requirements.	**Excellent** Excellent quality. Fulfills 100% of requirements. Additional distinctive features.

II. CITY LAYOUT CRITERIA (continued)	0	1	2	3
9. Is development thriving? • Degraded (gray) or abandoned (black) buildings in the residential, industrial or commercial zones	Over 50% of development degrading or abandoned.	Some (20-50%) of development degrading or abandoned.	Small amount (5-20%) of the development degrading or abandoned.	Vibrant city with little (<5%) of development degrading or abandoned.
10. Recreation facilities • Ratio of parks & recreation facilities to population (50:100K) • Well-funded facilities	Less than 15 areas per 100,000 residents. (Ratio < 0.00015)	At least 15 areas per 100,000 residents. (Ratio ≥ 0.00015)	At least 30 areas per 100,000 residents. (Ratio ≥ 0.0003)	At least 50 areas per 100,000 residents. (Ratio ≥ 0.0005)

11. City Planning
• City design is well-thought out, cohesive and structured
  • Zoning, neighborhoods
  • Traffic and transportation routes
  • Functionality and mixed-use areas
  • Downtown, amenities
  • Eco-management, sustainability, landscape management
	No apparent plan.	Some evidence of planning, but mostly evolutionary development.	Evidence of a plan, but execution could be better.	Well-thought out plan is evident.

III. CITY SERVICES (18 POINTS)	**0**	**1**	**2**	**3**
12. Police coverage • Adequate police coverage of populated areas • No serious crimes	Little (<50%) police coverage.	Some (approx. 50% to 90%) police coverage. Incidence of serious (red) crimes.	Adequate (>90% to 95%) police coverage - not all populated areas covered. Few serious (red) crimes.	Complete (>95%) police coverage. No serious (red) crimes.
13. Police effectiveness • Number of arrests tracks the number of crimes • Performance over time	Crimes far out number arrests.	20% or more variance in crimes over arrests.	Less than 20% variance in crimes over arrests. Trend improving through time.	Arrests closely track crimes over life of city.
14. Fire coverage • Adequate fire coverage of populated areas • Effective control of fire hazards	Little (<50%) fire coverage. Majority of city is dark orange to red.	Some (approx. 50% to 90%) fire coverage. Orange to red.	Adequate (>90% to 95%) fire coverage - not all populated areas covered. Orange.	Complete (>95%) fire coverage. Yellow to light orange.
15. Medical coverage • Adequate coverage of residential areas • Healthy population	No medical facilities present.	Some (approx. 50% to 90%) coverage in residential areas. Red to dark green.	Adequate (>90% to 95%) coverage in residential areas. Dark green to green.	Complete (>95%) coverage in residential areas. Green to light green.

Virtual City Design Rubric

0
No Points
Requirements missing

1
Poor
Poor-Fair quality. Fulfills less than 50% of requirements.

2
Good
Average-Above average quality. Fulfills at least 90% of requirements.

3
Excellent
Excellent quality. Fulfills 100% of requirements. Additional distinctive features.

III. CITY SERVICES (continued)	0	1	2	3
16. Education • Adequate coverage of residential areas • Educated population	No educational institutions.	Some (approx. 50% to 90%) coverage in residential areas. Red to dark green.	Adequate (>90% to 95%) coverage in residential areas. Dark green to green.	Complete (>95%) coverage in residential areas. Green to light green.
17. Life-long learning • Variety of education facilities • Education quotient high across all age groups	EQ is less than 120 for majority of the population.	EQ is 120 or higher in 3 or more age groups.	EQ is 120 or higher in 6 or more age groups.	EQ is 120 or higher in all age groups.
IV. ENERGY AND POLLUTION (18 POINTS)	**0**	**1**	**2**	**3**
18. Power coverage • Power to all areas of the city • Generation capacity sufficient to satisfy needs • Performance over time	Few areas (< 50%) have power. Demand exceeds capacity.	Some of city (>50%) has power. Some periods of inadequate capacity.	Most of city (> 90%) has power. Sufficient generation capacity majority of time.	All (100%) areas have power. Sufficient generation capacity over life of city.
19. Renewable energy sources • Renewable sources: wind, solar, hydrogen • Portion of total capacity	No renewable fuel sources.	1 form of renewable power.	Two or more forms of renewable power provide a portion of the capacity.	Two or more forms of renewable power provide 100% of capacity.
20. Water coverage • Water to all areas of the city • Supply capacity sufficient to satisfy needs • Performance over time	Few areas (<50%) have water. Demand exceeds capacity.	Some of city (>50%) has water. Some periods of inadequate capacity.	Most of city (>90%) have water. Sufficient capacity majority of the time.	All (100%) areas have water. Sufficient capacity over life of city.
21. Garbage disposal • Forms of garbage disposal: landfills, recycling, waste-to-energy plants • Disposal capacity adequate to satisfy needs • Garbage pollution under control	No forms of garbage disposal. Pollution high.	At least 1 form of garbage disposal. Demand exceeds capacity. Pollution high.	One or more forms of garbage disposal. Adequate capacity. Little or no garbage pollution.	Two or more forms of garbage disposal. Adequate capacity. No indication of garbage pollution.
22. Recycling facilities • Sufficient capacity • Ratio of facilities to residents (1:25K)	No recycling centers.	Less than 1 recycling center per 50,000 residents.	Less than 1 recycling center per 25,000 residents.	At least 1 recycling center per 25,000 residents.
23. Air and water pollution • Air pollution under control • Water pollution under control	Pollution (air OR water) covers more than 75% of city. Yellow to red.	Pollution (air OR water) covers 50-75% of city. Yellow to red.	Pollution (air AND water) covers less than 50% of city. Yellow to orange.	Pollution (air AND water) covers less than 25% of city. Predominately yellow.

CONTINUED ON NEXT PAGE

Virtual City Design Rubric

0	1	2	3
No Points Requirements missing	**Poor** Poor-Fair quality. Fulfills less than 50% of requirements.	**Good** Average-Above average quality. Fulfills at least 90% of requirements.	**Excellent** Excellent quality. Fulfills 100% of requirements. Additional distinctive features.

V. TRANSPORTATION (21 POINTS)	0	1	2	3
24. Road congestion • Traffic flow, congestion • Road repair, potholes (inadequate funding)	Traffic jam! Most of roads (>75%) are congested (orange to red) or roads impassable (potholes).	Many roads (30-75%) are congested (orange to red). Some need repair.	Some roads (10-30%) are congested (orange to red). No potholes.	Traffic flows freely. Less than 10% congestion (orange to red). No potholes.

25. Public Transportation
• Sims using the Public Transportation Systems
• Number of systems:
  • Bus
  • Subway
  • Monorail
  • Passenger train
  • Ferry
	No public transportation systems.	1 or more systems built. Sims not using them.	Sims using at least 1 public transportation system.	Sims using 2 or more public transportation systems.

26. Public Transportation–integrated systems • Integrated systems • Adequate coverage throughout the city	No public transportation systems.	Public transportation covers only part (<50%) of the city. Systems lack integration.	Public transportation covers most (>50%) of the city. Could be better integrated.	Public transportation provides excellent coverage throughout (>90%) city. Well-integrated systems.
27. Commute times • Average commute time • Performance over past 10 years	Commute time of more than 100 minutes.	Commute time of 100 minutes or less.	Commute time of 75 minutes or less.	Commute time of 50 minutes or less.

28. Freight transportation
• Sims using the freight transportation systems
• Number of systems
  • Freight truck
  • Freight train
  • Seaport
	No freight transportation systems used.	1 or more systems built. Sims (industry) not using them.	Industry using at least 1 freight transportation system.	Industry using 2 or more freight transportation systems.

29. Efficient freight movement • Integrated systems • Short freight trips	No freight transportation.	Few industrial facilities (< 50%) have short freight trips.	Most industrial facilities (> 50%) have short freight trips.	Freight moves efficiently throughout (> 90%) industrial area.

30. Airport
• Airport built
  • Landing strip (not fire department landing strip)
  • Municipal airport
  • International airport
• Airport well-funded
• Supports Co (Commercial Office) development
  • Road and public transportation connections
  • Direct connection to Co zone(s)
	No airport.	Airport is present. Partially funded. No traffic connection to Co.	Airport (any type) present. Well funded. Some connection to Co development, but could be better.	Municipal or International airport. Fully funded. Excellent traffic connections to city's major Co development areas.

Download a writeable PDF version of this form at **www.futurecity.org/forms.**

Virtual City Benchmark Form **(up to 10 points)**

- Students must use SimCity™ 4 Deluxe software to create their future city.
- The Virtual City Design (SimCity file) and this completed Benchmark Form must be submitted to your Regional Coordinator.
- Use the 10 items to help you benchmark your virtual city.
- Instructions on next page can help you find the necessary information.

Future City Name: _____

Educator Name: _____

Organization Name: _____

Organization Address: _____

Educator Email: _____

Engineer-Mentor Name: _____

Address: _____

Email: _____

The undersigned has verified the data submitted for accuracy and attests that no "cheat codes" were used in the development of the Virtual City.

_____

Signed by either educator or engineer-mentor Date

Virtual City Benchmarks

Each item is worth 1 point – Maximum number is 10 points	Values	Yes
1. Is the city at least 150 years old?		
2. Is the population at least 50,000?		
3. Can the city sustain a balanced budget (income > expenses)?	Inc:	
	Exp:	
4. Is wealth increasing: high land values? High-wealth Sims (R§§§)? High-tech industry?	Land:	
	R§§§:	
	I-HT:	
5. Do all of the buildings have power and water?	Power:	
	Water:	
6. Is the life-expectancy of the citizens > 70 years? (Average over 10 years)		
7. Is the Education Quotient > 120? (Average over 10 years)		
8. Are there any traffic complaints?		
9. Are crime and fire under control?	Crime:	
	Fire:	
10. Is pollution (air, water, garbage) under control?	Air:	
	Water:	
	Garbage:	
Count the number of "yes" answers. Each yes = 1 point	**Total Points (0–10)**	

Virtual City Benchmark Instructions

The ten benchmark items provide you with a basic evaluation tool for your virtual city. Use them to monitor your progress as you play the SimCity game. Be honest in your answers. Many of the items (see below) should be evaluated over time and not just as a one time "snapshot."

Listed below are instructions on how to locate the information for each of the items listed on the Virtual City Design Benchmark sheet. Remember to list your "values" (where applicable).

Question 1:

Year—Look in the bottom left corner for the city date. If your city is 150 years or later, put a check (or X) in the "Yes" column. Write the year in the values column.

Question 2:

Population—Enter "Mayor Mode" by clicking on the Top Hat icon in the lower left corner. On the Mayor toolbar, population is the bottom number under "Mayor Rating" (to the right of the tiny male figure). Enter this number on the form.

Question 3:

Budget—To get a snapshot view: (in Mayor Mode) click on the Simoleons (§) icon (bottom left – next to RCI meter) to open the budget panel. Enter monthly income and expenses on the form. To get a longer-term view, click on the Graphs icon (mid-right icon next to "City Opinion Polls"). Select the City Income/ Expenses view and slide the time frame out to get data over the life of your city. Income (green line) should be greater than expenses (red line) for the majority of the time period.

Question 4:

Increasing Wealth—(in Mayor Mode) click on the Data View icon (top right) and select Land Value. The populated areas of the city should be green. High Wealth Sims (R§§§) – click on the Graphs icon (middle right, below the Data View icon). Select Jobs & Population and look for R§§§. If necessary, turn off graphs (lines) for other options and look for an increasing population of high-wealth Sims over the life of the city. High-Tech Industry – using the same Jobs & Population graph, look for I-HT increasing population over time.

Question 5:

Power—click on the Data View icon (top right). Select Power and verify that all buildings are green.
Water – in Data View, select Water and verify that all of the buildings are blue. You can also do a building by building check in the main view of your virtual and making sure there are no "zots" above buildings with "no power" (lightning bolt) or "no water" (drip).

Question 6:

Life Expectancy—In the Graphs panel, select "Life Expectancy" and make sure the Time Scale is 10 years. Estimate the average value of the graph and enter it on the form.

Question 7:

Education Quotient—in the Graphs panel select "Education" and slide the Time Scale out to 10 years. Estimate the average value of graph and enter it on the form.

Question 8:

Traffic Complaints—click on the Advisors icon (middle left) and select the Transportation Advisor (second from right). The background of his picture should be blue or green and there should be no complaints listed.

Question 9:

Crime—click on the Data Views icon (top right) and select Crime. You should have coverage over the entire city and any crimes showing should be yellow or orange, not red.
Fire – in Data View, select Fire Hazard. You should have coverage over the entire city and it should be yellow or orange, not red.

Question 10:

Air Pollution—in Data View, select Air Pollution. The majority of the city should be clear and any pollution showing should be yellow or orange.
Water Pollution – in Data View, select Water Pollution. The majority of the city should be clear and any pollution showing should be yellow or orange.
Garbage Pollution – in Data View, select Garbage. The city should be clear of garbage.

Write the Research Essay

Scoring: **Up to 70 points**

Schedule:
September to December*

Students will spend approximately **10–12 hours** writing the essay.

*Dates may vary. Check futurecity.org for specific dates.

Students research and write an essay (maximum 1,000 words) in which they choose one energy source and design a way to generate electric power for their city that does not deplete natural resources and has limited impact on the environment.

This year's topic:

Fuel Your Future

IMAGINE NEW WAYS TO MEET OUR ENERGY NEEDS AND MAINTAIN A HEALTHY PLANET.

Every day we plug in and power up, thanks to electricity. We use electricity in hundreds of ways—to warm and cool our homes, charge our phones, light our streets, run our computers, and even cook our food. It takes energy to make electricity. In fact, about 40% of the total energy consumed in the U.S. is used to generate electricity. Most of this electricity is generated by large power plants. These plants use many fuels to make electricity—but over 60% of electricity is generated from fossil fuels, such as coal and natural gas. In a world in which fossil fuels are running out and in which climate change is a growing concern, we need to find new ways to generate electric power.

Your future city will likely rely on multiple sources of energy to generate electric power. Choose one alternative energy source and design a way to generate electric power for your city that does not deplete natural resources and has limited impact on the environment.

"I learned that engineers play a big role in the production of a city."

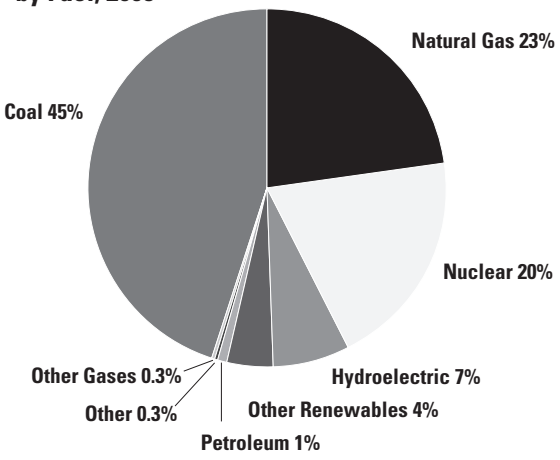
–Caroline Z., Chicago Student Team Member

Learning Outcomes

Students will be able to:

- Identify various energy sources that can be used to generate electricity
- Discuss how one energy source could be used to generate electric power for a city of the future
- Identify and analyze the risks and benefits related to using an energy source
- Recognize that perfectly designed solutions do not exist—all technological solutions have trade-offs such as safety, cost, efficiency, and appearance
- Describe the role of engineering in the development of solutions to energy needs
- Identify steps of the design process (define the problem to solve; brainstorm various solutions; select a solution; design, build, test and redesign solution; share results)

U.S. Electric Power Industry Net Generation by Fuel, 2009



Source: U.S. Energy Information Administration, Annual Energy Review 2009 (August 2010).

Guide Students' Thinking

Use these questions to help your students write a research essay that meets competition requirements.

1. What energy source will your city use to generate electricity?
2. How will your city generate and transmit/distribute electric power using this energy source?
3. What are the benefits of using this energy source?
4. How will using this energy source help offset dependence on fossil fuels?
5. Does the energy source have any environmental impacts?
6. What are the risks connected to using this energy source?
7. What will you incorporate into your design to reduce these risks?
8. What types of engineering are used in your design for generating electricity?
9. What is the role of the engineer you believe to be most useful to the creation and development of your solution?
10. As you develop your solution, how could you use the design process to help you work through problems (define the problem to solve; brainstorm various solutions; select a solution; design, build, test and redesign solution; share results)?
11. How can you represent your solution in your model?
12. Is your essay organized, well written, free of grammar and spelling errors, and no more than 1,000 words (not counting the title)?

"I learned so much about engineering this year, from research and writing to planning a presentation. I also worked on the multiple moving parts for our city. I thoroughly enjoyed the challenge and look forward to becoming a Civil Engineer."

– Logan B., Indiana Student Team Member

Draft Essay Using the Design Process

When engineers design solutions to problems, they go through a process of brainstorming, testing different ideas, learning from mistakes, and trying again. This is called the engineering design process.

The engineering design process is a great way to work through any challenge that involves creating something that did not exist before, such as building a bridge or writing an essay. You'll use the design process as a framework to guide students through researching and writing their essay solutions.

1. Warm Up: Tap into Prior Knowledge about Electricity

Launch the essay by getting kids to think about electricity. Ask them to list 10 things they did before they got to school (e.g., woke up to an alarm clock, made breakfast, checked text messages, etc.). Which of these use electricity and how?

Have students share what they already know about electricity and how it is generated and transmitted. (See the resources in the box for additional information.)

Point out that electricity is a secondary source of energy; we use many energy sources to make electricity. Ask students to list different energy sources used to generate electricity (e.g., coal, wind, natural gas, nuclear energy, hydropower, geothermal, biomass, batteries, etc.). Next, ask students to define (or provide them with a definition) of renewable and nonrenewable energy sources. Then have students identify which energy sources on the list are renewable and which are nonrenewable.

Introducing Energy and Electricity

- *Electricity in the U.S.*
  http://www.eia.doe.gov/kids/energy.cfm?page=electricity_in_the_united_states-basics
  Explores how electricity is generated, how it is transmitted to consumers, and the environmental impacts associated with the production and transmission of electricity.
- *Energy Sources*
  http://www.eia.doe.gov/kids/energy.cfm?page=2
  Explains nonrenewable and renewable energy sources, secondary energy sources (electricity and hydrogen), and recent energy statistics.
- *Smart Grid*
  http://www.pbs.org/wgbh/nova/tech/power-grid.html
  Explains how electricity is transmitted through the electric grid and introduces the smart grid.

Finding New Ways to Power the Future

To produce electricity, we rely on a mix of energy sources—coal, natural gas, oil, nuclear, hydropower, and other renewables. The way we use these fuels to make electricity has changed over the years. For example, just over 50 years ago nuclear energy played no role in producing electricity in the U.S., but in 2009, nuclear energy provided 20% of the fuel used to generate our electricity. The way we generate and deliver electricity is also changing. While most electricity made in the United States today is generated by large, central power plants, we are moving toward individually generated and managed power systems.

New sources of energy are being used every day and no energy source is perfect—each comes with its own set of benefits and risks. Wind power, for example, is a clean renewable energy source but wind turbines can be loud, obstruct views, and endanger the lives of birds and bats. Coal is inexpensive but burning coal produces greenhouse gases. Finding ways to maximize the benefits and minimize the risks is part of the challenge. Engineers and scientists are working to solve these problems by finding new energy solutions. What new ways can you imagine to power your future?

2. Identify the Problem, Learn the Specs

To get started, engineers define the problem they want to solve and the project requirements.

Help students define the problem by reviewing the essay topic together. How would they describe the essay problem using their own words? What are the different parts of the problem (choose an alternative energy source, describe how they would generate and transmit electricity using this energy source, analyze the benefits and risks of using the energy source, and incorporate into their design ways to reduce risks)? Remind students that the energy source they choose will likely be one of multiple sources their city uses to generate electric power.

3. Brainstorm Solutions

Next, engineers brainstorm a range of possible solutions.

Begin by having students individually write down and sketch ideas and solutions. Encourage them to think about which energy sources interest them (those in use today or being developed for tomorrow) and which energy sources would work best for their city (e.g., consider city design features, location, landform, etc.). Then have students share ideas and brainstorm as a group.

Once students finish the brainstorming, have them settle on two energy sources to begin researching. As they research, it's likely they'll need to refine their ideas and solve problems that come up. This is part of the process. Help students get started by pointing them to the Resources on page 26.

4. Select and Design a Solution

From their initial research, have students choose one energy source to research in depth and describe in their essay. As students research, invite them to consider the following issues. Note that they should eventually select at least 2 issues (in addition to environmental impact) to discuss in their essay:

- **Energy Efficiency** (How much energy is lost as you convert the primary energy source into electrical energy?)
- **Environmental Impact** (How does the production and transmission of electricity affect the environment, such as clearing land to build a power plant, disturbance of the visual landscape, air emissions, building access roads and transmission lines, disposal of waste, etc.?)
- **Fuel Availability** (Is the energy source renewable or nonrenewable? How easy is it to obtain the fuel?)
- **Fuel Cost** (What costs are related to supplying the energy source?)
- **Generation Cost** (What costs are associated with converting the energy source into electrical energy, such as building the power plant, storing the fuel, etc.?)
- **Infrastructure: Transmission/Distribution** (How will you move electricity from where it is generated to where it will be used?)
- **Reliability** (Is electricity available whenever you want and in whatever volume you want?)
- **Safety & Security Issues** (How would you protect against energy delivery disruptions, supply shortages, and vulnerability to natural disasters—such as earthquakes—and human-caused disasters—such as cyber attacks on the smart grid?)
- **Storage** (How would you store excess electricity to use during heavy demand or when the energy source is not available?)
- **Sustainability** (Can this energy source be used to meet present energy needs, as well as the needs of tomorrow?)
- **Waste Management** (How will you dispose of associated waste?)

5. Share Results

Engineers present their work to colleagues to show how they solved a problem and learn new ideas from each other.

Now it's time for your students to write their essay—the perfect vehicle for sharing their ideas with a panel of judges and kids across the country. Review with students the essay outline which describes the sections judges will be evaluating.

Remind students that the essay should be no longer than 1000 words and they should cite at least three sources of information. Students should use a variety of sources of information, such as interviews with experts, reference books, periodicals, and websites. (NOTE: Wikipedia is not accepted as a source of research.)

For additional tips about researching and writing the essay, and to read essays from past winners visit **www.futurecity.org**

Check Progress

As students develop their essays, invite them to reflect on the process and evaluate their solutions (this process will help prepare them for the judges' questions). Point out interesting ideas, creative thinking, and effective teamwork. Here are some questions to help guide discussion.

- What research has been helpful in choosing an energy source and designing your solution?
- Where did you get inspiration for your solution?
- What are the intended benefits of your solution?
- What trade-offs come with your solution?
- How has the design process been helpful to you?
- What have you learned about yourself and your teammates during this process?
- What have you learned about engineering that you didn't know before?

Research Essay Rubric—Have students review the rubric on pages 27–29 and evaluate their Essay using the same questions the judges do.

Essay Outline

I. INTRODUCTION: DEFINE THE PROBLEM

Briefly describe your future city. Introduce how your city will generate and transmit all or part of its electric power using an alternative energy source that does not deplete natural resources and has limited impact on the environment.

II. DESCRIBE YOUR SOLUTION

- Describe the alternative energy source you've chosen for your city.
- Discuss how your city will generate and transmit/distribute electric power using this energy source.
- Explain why you chose this energy source for your city (benefits), especially in terms of impact on natural resources and the environment.
- Explain how using this energy source would help offset dependence on fossil fuels.
- Discuss how your design addresses at least 2 additional issues (for example, waste disposal and reliability).
- Describe some of the risks related to using this energy source, especially in terms of impact on natural resources and the environment.
- Discuss how your design will reduce the risks associated with using this energy source. It can be a new idea or an improvement on something already being done.
- Describe the engineering disciplines involved in your solution and the role of the engineer you believe most useful to the development of your solution.

III. EVALUATE YOUR SOLUTION

- Perfectly designed solutions do not exist. What trade-offs come with using your energy source to generate electricity (such as cost, efficiency, appearance)?
- Discuss why the energy source you chose is still the best solution for your city.

IV. CONCLUSION

Summarize your ideas and findings.

Competition Checklist

- ◯ Include the name of your city on each page of your Research Essay. Remember, your future city name needs to remain consistent throughout the competition. Also, please include the organization name and your team name on the essay.
- ◯ Place the word count at the end of the essay. The word count does not include the title and reference list, but does include captions of graphics and illustrations. A maximum of 4 graphics/illustrations are allowed.
- ◯ Complete the **Research Essay Form.** You can find this form on page 30 or download the writeable PDF at **www.futurecity.org.** *Please remember the educator or the mentor must sign the form to attest to its accuracy.*
- ◯ Use a variety of sources of information for research, such as interviews with experts, reference books, newspaper and magazine articles, and websites (Wikipedia is **not** accepted). Be sure to attach a list of at least three sources and use the Modern Language Association (MLA) format. Go to **www.futurecity.org** to download a MLA reference template.
- ◯ Make a copy of the Essay Form, Research Essay, and Reference List to keep with your records.
- ◯ Submit the Research Essay and Research Essay Form to your Regional Coordinator.

For submission details and deadlines go to **www.futurecity.org** and click on *Find My Region.*

Competition Scoring

Teams can earn up to 70 points for their Research Essay. Make sure students have thoroughly covered the six categories to maximize points:

Define the Problem	6 points
Describe the Technology	6 points
Analyze the Solution	18 points
Assess Innovation/Effectiveness	18 points
Role of Engineering	6 points
Writing Skills	16 points
Total	**70 points**

Scoring Deductions

5 points Late essays will lose points.

2 points A missing or incomplete **Research Essay Form.**

10 points Count carefully—10 points will be deducted for exceeding the 1,000 word count limit.

Resources

Use these online and print resources to help students launch their research.

Energy Basics

WEBSITES:

- *Energy Kids: U.S. Energy Information Administration*
  http://www.eia.doe.gov/kids/index.cfm
  Explains the basics of energy, different energy sources (renewable, nonrenewable, and secondary), and the history of energy. Also contains a games/activities section and resources for educators.
- *Engineering for Change*
  https://www.engineeringforchange.org/solution/library/viewAll/Energy
  Visit the Solutions Library (Energy) to learn how engineers around the world are designing new ways to generate and transmit electricity.
- *How Does Electricity Affect the Environment?*
  http://www.epa.gov/cleanenergy/energy-and-you/affect/index.html
  Explores how different ways of generating electricity affect the environment.
- *NEED Energy InfoBooks*
  http://need.org/Energy-Infobooks
  Contains information about different energy resources and new technologies. Organized by subject and grade level, with "Intermediate" geared toward middle school.

BOOKS

- ***Alternative Energy Sources*** by Sally Morgan (Heinemann, 2009)
  Discusses the pros and cons of fossil fuels and various alternative energy sources available today.
- ***Energy for Keeps: Creating Clean Electricity from Renewable Sources*** by Marilyn Nemzer, Deborah Page, Anna Carter (Energy Education Group, 2010)
  Explains how electricity can be generated from various energy sources and introduces issues related to our current energy choices.

Innovative Energy Ideas

- *Energize Your Future*
  http://www.shell.us/home/content/usa/environment_society/education/student/
  Explores how we use fossil fuels and renewable energy sources to meet the world's energy needs.
- *Engineering Go for It: What's New?*
  http://students.egfi-k12.org/
  Contains articles about innovative engineering solutions for energy issues (use Search box to locate articles).
- *NSF: Green Revolution*
  http://www.nsf.gov/news/special_reports/greenrevolution/index.jsp
  Features videos of scientists and engineers who are working to develop and improve the use of clean energy sources, new fuels, and other energy-related technologies.
- *Sustainable Cities: Energy Case Studies*
  http://sustainablecities.dk/en/search-criterias/energy
  Showcases what cities around the world are doing to address energy issues and create more sustainable living.

Careers

- *Energy Kid's Career Corner*
  http://www.eia.doe.gov/kids/energy cfm?page=activities_career_corner
- *Engineer Your Life*
  http://engineeryourlife.org/
- *Sloane Career Cornerstone Center*
  http://www.careercornerstone.org/paths/smid.htm

Word Search Suggestions

- Alternative energy
- Clean energy
- Conservation
- Consumption
- Efficiency
- Electric Grid
- Electricity
- Electricity generation
- Global warming
- Green energy
- Nonrenewables (coal, fossil fuel, natural gas, oil, petroleum, propane, uranium)
- Renewables (biomass, geothermal, hydropower, solar, wind)
- Smart grid
- Sustainable
- Transmission and distribution

Field Trip Ideas

Visit places or interview people related to energy/electricity.

- Electric power plant
- Science center or museum
- University or college that has experts in the field
- Businesses–like a local utility, project management firms, consulting companies, or manufacturers of power equipment

Fuel Your Future Research Essay Rubric

0	1	2	3
No Points Requirements missing	**Poor** Poor-Fair quality. Fulfills less than 50% of requirements.	**Good** Average-Above average quality. Fulfills at least 90% of requirements.	**Excellent** Excellent quality. Fulfills 100% of requirements. Additional distinctive features.

I. DEFINE THE PROBLEM, PROPOSE SOLUTION (6 POINTS)	0	1	2	3
1. Define problem • Introduce city • Introduce electric power systems infrastructure (transmission & distribution)	No description of city or power infrastructure.	Brief description of city and power infrastructure.	Good introduction of city and power infrastructure.	Detailed introduction of city and power infrastructure.
2. Propose alternative energy source • Alternative energy source for power generation • Possibly one of several sources used by city • Offsets dependence on fossil fuels	No description of alternative energy source.	Brief description of alternative energy source.	Good description of alternative energy source.	Detailed description of alternative energy source.
II. DESCRIBE THE TECHNOLOGY (6 POINTS)	**0**	**1**	**2**	**3**
3. Power generation with alternative energy source	No description of the generation technology or process.	Brief description of the generation technology or process.	Good description of the generation technology or process.	Excellent description of the generation technology or process.
4. Transmission and distribution of generated power	No description of the transmission technology or process.	Brief description of the transmission technology or process.	Good description of the transmission technology or process.	Excellent description of the transmission technology or process.
III. ANAYLZE THE SOLUTION (18 POINTS)	**0**	**1**	**2**	**3**
5. Impact on depletion of natural resources • Consider: harvesting, generation, distribution, waste disposal	No discussion of impact on natural resources.	Brief discussion of impact on natural resources.	Good discussion of impact on natural resources, but could be more complete.	Detailed and complete discussion of impact on natural resources.
6. Impact on environment • Consider: harvesting, generation, distribution, waste disposal	No discussion of impact on environment.	Brief discussion of impact on environment.	Good discussion of impact on environment, but could be more complete.	Detailed and complete discussion of impact on environment.
7. Benefits • Environmental and other benefits	No discussion of benefits.	Some discussion of benefits.	Good discussion of benefits, but could be more complete.	Detailed and complete discussion of benefits.
8. Risks	No discussion of risks.	Some discussion of risks.	Good discussion of risks, but could be more complete.	Detailed and complete discussion of risks.

CONTINUED ON NEXT PAGE

Fuel Your Future Research Essay Rubric

0	1	2	3
No Points Requirements missing	**Poor** Poor-Fair quality. Fulfills less than 50% of requirements.	**Good** Average-Above average quality. Fulfills at least 90% of requirements.	**Excellent** Excellent quality. Fulfills 100% of requirements. Additional distinctive features.

III. ANAYLZE THE SOLUTION (continued)	0	1	2	3
9. Additional issues • Consider two issues (in addition to environmental) • Transmission/distribution • Efficiency • Availability • Cost • Reliability • Safety, security • Storage • Sustainability • Waste management	No discussion of additional issues.	Some discussion of at least one additional issue.	Good discussion of two additional issues, but could be more complete.	Detailed and complete discussion of at least two additional issues.
10. Tradeoffs • Discuss and analyze tradeoffs (e.g., cost, efficiency, appearance)	No discussion or analysis of tradeoffs.	Brief discussion and analysis of tradeoffs.	Good discussion and analysis of tradeoffs.	Excellent discussion and analysis of tradeoffs.
IV. ASSESS INNOVATION/ EFFECTIVENESS (18 POINTS)	**0**	**1**	**2**	**3**
11. Innovative and futuristic solution	Not innovative or original.	Somewhat original or innovative. Not futuristic.	Solution is innovative, original and somewhat futuristic.	Solution is highly innovative, original and futuristic.
12. Plausibility of solution • Based on sound scientific principles	Implausible or not scientifically sound.	Solution is not very plausible (science fiction).	Solution is somewhat plausible.	Solution is highly plausible and scientifically sound.
13. Accounting for identified risks	Solution does not account for identified risks. Or no risks identified.	Solution partially accounts for identified risks. Ignores major areas.	Solution adequately accounts for identified risks, but could be better.	Solution accounts for all identified risks.
14. Effectiveness of solution: reduces associated risks?	Not effective.	Solution is fairly effective.	Solution is effective, but could be better.	Design is highly effective.
15. Effectiveness of solution: limiting environmental impact?	Not effective.	Solution is fairly effective.	Solution is effective, but could be better.	Design is highly effective.
16. Effectiveness of solution: offsetting dependence on fossil fuels?	Not effective.	Solution is fairly effective.	Solution is effective, but could be better.	Design is highly effective.

Fuel Your Future Research Essay Rubric

0	1	2	3
No Points Requirements missing	**Poor** Poor-Fair quality. Fulfills less than 50% of requirements.	**Good** Average-Above average quality. Fulfills at least 90% of requirements.	**Excellent** Excellent quality. Fulfills 100% of requirements. Additional distinctive features.

V. ROLE OF ENGINEERING (6 POINTS)	0	1	2	3
17. Engineering disciplines involved	Engineering disciplines are not identified.	One Engineering discipline is identified.	More than one engineering discipline is identified.	More than one engineering discipline is discussed.
18. Role of an engineer	The role of the various engineers involved in developing the solution is not discussed.	The role of at least one engineer involved in developing the solution is briefly discussed.	The role of at least one engineer is adequately discussed.	The role of one or more engineers is well discussed.
VI. WRITING SKILLS (16 POINTS)	**0**	**1**	**2**	**3**
19. Organization	Poorly organized.	Fair organization.	Good organization.	
20. Maximum number of graphics • If used, maximum of 4 (does not include tables)	Exceeds maximum of 4 graphics, illustrations.		Does not exceed maximum of 4 graphics and/or illustrations.	
21. Work appears age appropriate	Work does not appear to be age appropriate.		Work appears to be age appropriate.	
22. Grammar	Many grammatical errors.	A few grammatical errors.	No grammatical errors.	
23. Spelling	Many spelling errors.	A few spelling errors.	No spelling errors.	
24. Writing skills	Poorly written.	Fair writing skills.	Good writing skills.	Exceptional writing skills.
25. List of references • At least three acceptable references • Wikipedia not recognized as an acceptable reference • Appropriate citations	No references.	Less than three acceptable references.	At least three acceptable references.	At least three acceptable references. All appropriately cited.

Download a writeable PDF version of this form at **www.futurecity.org/forms.**

Research Essay Form

When you submit your Research Essay, please attach this form. If your Regional Coordinator requires more than one copy of your Research Essay, this form must accompany each copy.

Quick Checklist

Check the boxes below to indicate the completion of each item.

- ◯ Did you include the word count at the end of the Essay?
  Remember there is a **1000 word maximum.** This number does not include the title or the reference list.
- ◯ Did you include a list of at least **three references**?
- ◯ Did you make **a copy** of the Essay, List of References, and the Research Essay Form for your files?

Required Information

Future City Name: _____

Educator Name: _____

Organization Name: _____

Address: _____

Phone Number: _____ Fax Number _____

Educator Email Address: _____

1. Student Name: _____ Grade Level: _____

2. Student Name: _____ Grade Level: _____

3. Student Name: _____ Grade Level: _____

Verified for Accuracy

I verify that the students wrote the Research Essay.

_____

Signed by either educator or engineer-mentor Date

Write the City Narrative

Scoring: **Up to 20 points**

Schedule:
October to December*

Students will spend approximately **3–6 hours** writing the narrative.

*Dates may vary. Check futurecity.org for specific dates.

Students write a narrative (maximum 500 words) describing their future city's key features and design attributes. The purpose of the City Narrative is to give the judges a quick overview of the future city's infrastructure and its public services.

Learning Outcomes

Students will be able to:

- Identify and explain features that best describe their city
- Summarize what makes their city unique and futuristic

Guide Students' Thinking

Use these questions to help your students write a city description that meets competition requirements.

1. What basic information should people know about your city (such as the name, population, age, and location)?
2. What is important to know about your city's physical components (landmarks, parks, and recreation areas) and infrastructure (transportation, energy, waste disposal, pollution control)?
3. What services (such as police, fire, medical, education) does your city offer?
4. What features make your city innovative and unique?
5. Is your narrative organized, well written, free of spelling errors, and no more than 500 words (not counting the title)?

"The whole class worked really hard on the project and the students learned a lot during the process of creating their city. I think I learned as much as they did from the whole experience."

– Grant Richardson, Teacher, Washington State

Tips

Read City Narratives from past participants at the Future City Showcase at www.futurecity.org

Think of the City Narrative as a marketing piece. What unique features does your city offer? Why would someone want to live in your city? Are there any special benefits to living in your city?

Check Progress

Peer review—Have the students ask other team members or students from another class to review a draft of the narrative. Then ask the peer reviewers to discuss the following:

- Can they identify one thing that was strong about the content of the narrative?
- Was there something in the narrative that they didn't understand?
- Did the narrative make them want to live in the city? Why or why not?
- Ask them to list one or two things they liked about the way the narrative was written.
- Did they find grammar or spelling errors?

City Narrative Rubric—Have students review the rubric on page 33 and evaluate their narrative the same way the judges do.

Competition Checklist

- ◯ List the name of your city on each page of your City Narrative. Remember, your city name needs to remain consistent throughout the competition. Also, please include the organization's name and your team name on the narrative.
- ◯ Place the word count at the end of the City Narrative. Word count does not include the title.
- ◯ Complete a **City Narrative Form** attesting that the City Narrative was written entirely by the students. *See page 34 or go to* **www.futurecity.org/forms** *to download a writeable PDF of this form.*
- ◯ Make a copy of the City Narrative for your records.
- ◯ Submit the City Narrative and **City Narrative Form** to your Regional Coordinator.

For submission details and deadlines go to **www.futurecity.org** and click on *Find My Region.*

Competition Scoring

Teams can earn up to 20 points for their City Narrative. Make sure students have thoroughly covered both categories to maximize points:

Describe the City	12 points
Writing Skills	8 points
Total	**20 points**

Scoring Deductions

5 points Late narratives will lose points.

2 points Don't forget the **City Narrative Form.** A missing or incomplete form costs points**.**

2 points Count carefully—points will be deducted for exceeding the 500 word count.

City Narrative Rubric

0	1	2	3
No Points Requirements missing	**Poor** Poor-Fair quality. Fulfills less than 50% of requirements.	**Good** Average-Above average quality. Fulfills at least 90% of requirements.	**Excellent** Excellent quality. Fulfills 100% of requirements. Additional distinctive features.

I. DESCRIBE THE CITY (12 POINTS)	0	1	2	3
1. Basic City information • Population, age • Location	No basic information.	Brief basic information.	Good basic information.	Complete basic information included.
2. City's physical components & infrastructure • Landmarks • Parks & recreation • Other highlights	No description of physical components.	Brief description of physical components.	Good discussion of physical components.	Detailed description of physical components.
3. City's services • Health, safety, education • Other quality of life issues	No description of city services.	Brief description of city services.	Good description of city services.	Detailed description of city services.
4. Other unique attributes of the City	No unique attributes.	Brief description of unique attributes.	Good description of unique attributes.	Detailed description of unique attributes.
II. WRITING SKILLS (8 POINTS)	**0**	**1**	**2**	**3**
5. Organization	Poorly organized.	Fair organization.	Good organization.	
6. Writing skills	Poorly written.	Fair writing skills.	Good writing skills.	
7. Grammar	Many grammatical errors.	A few grammatical errors.	No grammatical errors.	
8. Spelling	Many spelling errors.	A few spelling errors.	No spelling errors.	

Download a writeable PDF version
of this form at **www.futurecity.org/forms.**

City Narrative Form

Submit the City Narrative with this form attached to the front.

If your Regional Coordinator requires more than one copy of your City Narrative, a copy of this form must accompany each submitted copy.

Quick Checklist

Check the boxes below to indicate the completion of each item.

- ◯ Is the City Narrative **500 words** or less? This number does not include the title.
- ◯ Did you include the **word count** at the end of the City Narrative?
- ◯ Did you make **a copy** of the City Narrative for your files?

Required Information

Future City Name: _____

Educator Name: _____

Organization Name: _____

Organization Address: _____

Phone Number: _____ Fax Number: _____

Educator Email Address: _____

1. Student Name: _____ Grade Level: _____

2. Student Name: _____ Grade Level: _____

3. Student Name: _____ Grade Level: _____

Verified for Accuracy

I verify that the students wrote the City Narrative.

_____

Signed by either educator or engineer-mentor Date

Build the Model

Scoring: **Up to 120 points**

Schedule:
October to January*

Students will spend approximately **20–30 hours** building their model.

*Dates may vary. Check futurecity.org for specific dates.

Students build a physical model of a section of their city using recycled materials that has at least one moving part. The model does not need to be an exact building-by-building duplication of the virtual design. Rather, the purpose of the model is to give a 3-dimensional, creative representation of an area that best represents the team's vision of their future city.

Learning Outcomes

Students will be able to:

- Identify an appropriate scale for the model.
- Use the scale consistently throughout the model.
- Identify and build features that best represent the city design.
- Apply understanding of energy, work, and power to build a moving part.

Physical Model Requirements

1. The model must be built to scale as determined by the team.
2. The model must be no bigger than 25" (W) x 50" (L) x 20" (H) including all support braces, material hanging below or beyond the tabletop, and any fully extended parts, such as access doors or hinged pullouts.
3. Vertical-oriented models are not accepted.
4. The model must contain one or more moving part(s). Any electrical power must be self-contained (e.g., a household battery and a simple circuit.)
5. Use of electrical floor or wall outlets is not allowed.
6. No perishable items may be used in building the model.
7. No live animals may be used in the model.
8. The total value of the materials used in the model, as well as those used in support of the presentation and special awards, (including color copying/printing, visual aids, costumes, and other demonstration aids) may not exceed $100 and must be reported on the Competition Expense Form found on page 41.
9. While individual pieces from previous competition models may be reused, models should be a new representation of a future city and built from the baseboard up.
10. No hazardous (e.g., dry ice) or perishable items may be used in building the model.
11. No audio or sound may be used as part of the model.

Guide Students' Thinking

Use these questions to help your students build a model that meets competition requirements.

1. What scale would work best for your model?
2. What features would best represent your city (buildings, zones, landforms, interconnectivity, and infrastructure such as transportation, energy, waste disposal, pollution control)?
3. How can you show that your city is well planned, accessible, and considers the environment?
4. What makes your city innovative and futuristic? How can you show your futuristic ideas are based on science and engineering?
5. How will you include your solution to the Fuel Your Future essay in your model?
6. What recycled materials could you use? How could you use them in creative ways?
7. What will your moving part(s) do? How does it represent an important element of your city design?
8. How will you power your moving part(s)? Can you easily repeat the movement?
9. As you build your model, how could you use the engineering design process to help you work through problems (define the problem to solve; brainstorm various solutions; select a solution; design, build, test and redesign solution; share results)?

Learning Blocks

PHYSICAL MODEL BUILDING CONCEPTS

In this Learning Block, students will begin by studying the mathematics of ratio and proportion and then apply those concepts to create a scale drawing of a room. Moving from two-dimensions to three-dimensions, students will explore building scale. Finally, they will investigate the affect of design and arrangement on the strength of structures.

PHYSICAL MODEL CONSTRUCTION

This Learning Block covers the importance of models and basic strategies for constructing a model and its moving parts.

Check out the learning blocks online at **www.futurecity.org/learningblocks**

Tips

Check out the Showcase at **www.futurecity.org** to see models from past competitions.

Choose a scale that works for your city design. In engineering, scale is used to describe proportion. Proportion is how the size of one thing compares with another. There is no set scale for the model. The team decides the scale based on their design. They will need to create a scale key, such as, 1/4" = 1.0'.

Research Essay. Be sure to represent your team's solution to the Fuel Your Future Research Essay in the model.

Remember to add at least one moving part. The moving part is an excellent opportunity to explore the physics of simple sources of power, such as:

- Rubber bands
- Weights
- Batteries and simple circuitry
- Paper folded, pop-up constructions
- Heat
- Springs
- Pulleys
- Light and/or solar power

Before building, think about shipping.

1. How can you protect the model from breaking during shipping and moving?
2. What materials will you use to protect the model?
3. How much thickness and bulk will the packing materials add to the model? Note: If the team advances to the National Finals shipping weight can not exceed 75 pounds.
4. What is the maximum height, length, and width the finished model can be to accommodate the packing materials?
5. How will these measurements affect the scale of the model?

Collect recycled materials. You only have a $100 budget so think creatively about your building materials.

1. Flea markets and garage sales are excellent sources for old toys, bottles, tins, buttons.
2. Younger brothers and sisters may be persuaded to part with toys they have outgrown. Old toys are excellent sources for materials, such as Lego® pieces, gears, Tinker Toys®, and blocks. NOTE: All these items have value and need to be listed on the Competition Expense Form.
3. Offices and businesses may have recyclable waste paper, wire, etc.
4. Builders and plumbers may have discarded pieces of pipe, wire, wood, etc.
5. Home improvement companies and remodelers may be willing to part with obsolete materials from houses they are remodeling. Old parts from stoves, cabinets, and plumbing fixtures may be sources for moving parts and provide unusual shapes for your buildings.
6. Find somebody who has just moved into your community or who receives a lot of parcels. These are good sources for boxes, cardboard, and bubble wrap.

Check Progress

Physical Model Rubric— Have students review the rubric on pages 38 to 40 and evaluate their model the same way the judges do.

Competition Checklist

- ◯ Complete a Physical Model Identification Index Card —This 4x6 inch index card is used by the judges to identify your team's information. The card should provide:
  - City name
  - Scale used for the model
  - Organization name
  - Names of the three presenting students, educator, and mentor.
- ◯ Bring the Physical Model Identification Index Card with you to the Regional Competition and place it next to your team's model.
- ◯ Fill out the **Competition Expense Form** with all of the materials used to build the model and the presentation materials. Remember you cannot exceed a combined total of $100. *See page 41 for the form or download a writeable PDF version at www.futurecity.org.*
- ◯ Bring the **Competition Expense Form, Media Waiver Form,** and **Honor Form** to your Regional Competition. See pages 48 and 49 for a copy of these forms or download writeable PDF versions at **www.futurecity.org.**
- ◯ Each team is responsible for transporting their model to the Regional Competition.
- ◯ Models may sustain damage in transit. Teams are encouraged to bring repair kits (containing tape, glue, etc.) to reattach or fix any broken part. The model needs to be sturdy and substantial enough for staff to move during the course of the competition without incurring damage. NOTE: There can be no structural changes made during or after the Regional Competition.

For submission details and deadlines go to **www.futurecity.org** and click on *Find My Region.*

Competition Scoring

Teams can earn up to 120 points for their model. Make sure students cover all five categories to maximize points:

Creativity	20 points
Quality and Scale	20 points
City Design	50 points
Moving Part(s)	20 points
Recycled Materials	10 points
Total	**120 points**

Scoring Deductions

15 points Models that exceed the competition's stated model dimensions of 20 inches high, 50 inches long, and 25 inches wide will lose points.

1–5 points Remember your Physical Model Identification Index Card and proofread it to make sure it includes all of the required information.

15 points There is only a $100 budget for the physical model and presentation materials combined.

15 points A missing or incomplete Competition Expense Form costs points.

5 points Remember to include your receipts with your Competition Expense Form.

Physical Model Rubric

0	2	4	6	8	10
No Points Requirements missing	**Poor** Poor-Fair quality. Fulfills at least 20% of requirements.	**Fair** Fair-Average quality. Fulfills at least 50% of requirements	**Good** Average quality. Fulfills at least 90% of requirements.	**Very Good** Above average quality. Fulfills 100% of requirements.	**Excellent** Excellent quality. Fulfills 100% of requirements. Additional distinctive features.

I. CREATIVITY (20 POINTS)	0	2	4	6	8	10
1. Illustration of Futuristic Designs • Buildings and/or structures • Infrastructure (mag-lev, space elevator) • Location (outer space, underwater, ice cap, desert) • Plausible and recognizable as a city	No futuristic designs that are plausible.	Includes 1-2 futuristic designs that are plausible.	Includes few futuristic designs, 1-2 are plausible.	Several futuristic designs, few plausible.	Many futuristic designs, most plausible.	Highly futuristic. Very plausible.
2. Appearance • Use of color, graphics, shapes, etc. • Realistic elements (flora, fauna, landscapes) • Pleasing, not distracting	Not complimentary, distracting.	Fulfills at least 20% of requirements. Fair aesthetics, somewhat distracting.	Fulfills at least 50% of requirements. Fair aesthetics, not distracting.	Fulfills at least 90% of requirements. Good aesthetics enhance the model.	Very good aesthetics enhance the model.	Excellent aesthetics enhance the model.
II. QUALITY & SCALE (20 POINTS)	**0**	**2**	**4**	**6**	**8**	**10**
3. Quality Workmanship and Age Appropriateness • Age appropriate for 6th, 7th, and 8th grades • Quality construction • Reasonably durable	Poor quality.	Mediocre quality.	Fair to good quality.	Good quality. Age appropriate.	Very good quality. Age appropriate.	Excellent quality. Age appropriate.
4. Model Scale: _____ • Appropriate scale chosen to create a good city model • Consistent scale throughout model • Applied horizontally and vertically	Inappropriate scale choice. Inconsistently applied.	Poor scale choice. Inconsistent scale for majority of model.	Fair scale choice. Some inconsistencies.	Good scale choice. Consistently applied over majority of model.	Very good scale choice. City elements easy to identify. Consistent application.	Exceptional scale choice. City elements very easy to identify. Consistent application across entire model.
III. CITY DESIGN (50 POINTS)	**0**	**2**	**4**	**6**	**8**	**10**
5. City Design and Livability • Well planned design and layout (neighborhoods, green spaces, streets) • Accessibility, functionality, mixed-use • Eco-management: sustainability, landscape conservation	Fails to include expected requirements.	Little planning.	Some planning.	Planned design, accessible, mixed-use. Considers environment.	Well planned design. Accessible and mixed-use areas. Considers environment.	Excellent planning, accessibility, and environmental management.

Physical Model Rubric

0	2	4	6	8	10
No Points Requirements missing	**Poor** Poor-Fair quality. Fulfills at least 20% of requirements.	**Fair** Fair-Average quality. Fulfills at least 50% of requirements	**Good** Average quality. Fulfills at least 90% of requirements.	**Very Good** Above average quality. Fulfills 100% of requirements.	**Excellent** Excellent quality. Fulfills 100% of requirements. Additional distinctive features.

III. CITY DESIGN (Continued)	0	2	4	6	8	10
6. Zones & Interconnectivity • Variety of city zones, structures, infrastructure components • Interconnectivity of zones and components • Transportation: pedestrian, personal, public, goods & services	Zoning unclear.	One zone, few structures. Little inter-connectivity.	At least one zone, small variety of structures. Some inter-connectivity. Some awkward design.	1-2 zones, some variety of structures. Adequate inter-connectivity.	Two or more zones. Good variety of structures. Good inter-connectivity.	Two or more zones, very good variety of structures. Very good inter-connectivity.
7. Futuristic Technologies • Examples of futuristic technologies, components • Scientifically sound	No futuristic examples.	1-2 futuristic examples. None scientifically sound.	Few futuristic examples. At least one scientifically sound.	Some futuristic examples. 2-3 are scientifically sound.	Several futuristic examples, many of which are scientifically sound.	Highly futuristic, and based on sound scientific principles.
8. Innovative Solutions • Examples of solutions to problems: transportation, environment, services, etc. • At least one original, innovative solution	No solutions.	One solution. Not innovative.	One solution. Somewhat innovative.	More than one solution. Somewhat innovative and plausible.	More than one solution. Innovative and plausible.	Several innovative and plausible solutions.
9. Essay Topic: Alternative Energy / Electrical Infrastructure • Incorporating essay topic into model • Alternative energy source for city's electrical infrastructure that does not deplete natural resources and has limited environmental impact.	No examples of any part of the electrical system.	Small portion of the electrical power system shown. Poor illustration of alternative energy source.	Some of the electrical system illustrated and the alternative energy source.	Good overall illustration of an alternative energy source and the electrical system/ infrastructure. Could be more com-prehensive.	Very good overall illustration of alternative energy source and city's electrical system.	Excellent illustration and overall solution for an alternative energy source for the city's electrical infrastructure.

CONTINUED ON NEXT PAGE

Physical Model Rubric

0	2	4	6	8	10
No Points Requirements missing	**Poor** Poor-Fair quality. Fulfills at least 20% of requirements.	**Fair** Fair-Average quality. Fulfills at least 50% of requirements	**Good** Average quality. Fulfills at least 90% of requirements.	**Very Good** Above average quality. Fulfills 100% of requirements.	**Excellent** Excellent quality. Fulfills 100% of requirements. Additional distinctive features.

IV. MOVING PART(S) COMPONENT (20 POINTS)	0	2	4	6	8	10
10. Moving Part(s) Innovation and Quality • At least one moving part • Quality workmanship, durability • Repeatability of movement • Innovative execution	No moving parts.	One moving part. Fair quality. One time movement.	One moving part. Good quality. Little innovation.	At least one moving part. Good quality. Repeatable movement. Somewhat innovative.	More than one moving part. Very good quality. Repeatable movement. Innovative.	More than one moving part. Excellent quality. Repeatable movement. Highly innovative.
11. Moving Part(s) Relationship to the Design or Function of the City • At least one moving part • Closely related to function of the city	No moving parts.	Moving part cosmetic; not relevant to city design.	Moving part loosely related to city design.	Moving part closely related to city design.	At least one moving part essential to city design.	More than one moving part essential to city design.
V. USE OF RECYCLED MATERIALS (10 POINTS)	**0**	**2**	**4**	**6**	**8**	**10**
12. Use of Recycled Materials • Most of model made from recycled materials • Variety of materials, imaginative or unusual materials • Creative modification or application of materials	No recycled materials used.	Few recycled materials. Not creative. No variety. No modifications.	At least 50% recycled materials. Little creativity, variety. Some attempt to modify.	More than 75% recycled. Some variety. Some creatively modified.	More than 75% recycled. Good variety. Many creative materials and modifications.	Almost all recycled. Exceptionally varied and creatively modified materials.

Download a writeable PDF version
of this form at **www.futurecity.org/forms.**

Competition Expense Form

Future City Name: _____

Organization Name: _____

Educator Phone: _____ Email Address: _____

Quick Checklist

Check the boxes below to indicate the completion of each item.

- ◯ Reviewed official competition rules and instructions.
- ◯ List all materials used in the building of your physical model AND materials used to support your team presentation and special awards. Easels do not need to be included as a competition expense. If necessary, add an additional sheet of paper.
- ◯ Mark the appropriate field (purchased, donated, or recycled) to indicate the origin of materials used in the physical model and presentation materials.
- ◯ Staple receipt copies to the back of this form. Make photocopy of form and receipts for team records.
- ◯ Bring this completed form to the Regional Competition.

Description of Physical Model Materials	Purchased	Donated	Recycled	Expense/Value
			Subtotal A—Physical Model Expenses:	

Description of Presentation Materials	Purchased	Donated	Recycled	Expense/Value
			Subtotal B—Presentation Materials Expenses:	

Subtotal A _____ + Subtotal B _____ = Total Expenses _____

Verified for Accuracy

_____

Signed by either educator or engineer-mentor Date

Competition Expense Form Instructions

Provide a complete list of all items used in the construction of your model and creation of your presentation materials, including actual cost or reasonable estimates for donated items.

Students are encouraged to recycle common materials, such as plastic tubs, glass jars and metal containers. These type of recycled items may be assigned a zero cost value. Other used or donated items must be assigned a fair market or salvaged value. Fair market or salvaged value may be determined by pricing found at a yard sale, auction, classified ads, surplus store, etc.

**Reminder: No laptop computers, overhead projectors, or videos can be used at the Future City Competition Regional and National Final presentations.

Examples

Description of Physical Model Materials	Purchased	Donated	Recycled	Expense/Value
4 x 8 plywood sheet – $10 (but only used half)	•			$5.00
Assorted paint from parent's garage		•		$2.00
Two liter soda/pop bottles			•	$0.00
Egg carton			•	$0.00
Toy train		•		$2.00
			Subtotal A—Physical Model Expenses:	$9.00

Description of Presentation Model Materials	Purchased	Donated	Recycled	Expense/Value
Poster board	•			$5.00
5 color copies	•			$5.00
			Subtotal B—Presentation Materials Expenses:	$10.00

Subtotal A $9.00 + Subtotal B $10.00 = Total Expenses $19.00

Team Presentation

Scoring: **Up to 90 points**

Schedule: **January**

Students will spend approximately **7 hours** preparing their presentation.

Students give a 7 minute presentation discussing features of their future city followed by a 5 – 8 minute question and answer period from the judges (overall time will not exceed 15 minutes). Be sure to check with your Regional Coordinator for exact competition times.

Learning Outcomes

Students will be able to:

- Identify and explain features that best describe their city design.
- Illustrate city design features using the physical model, props, and visual aids.
- Demonstrate teamwork (such as sharing presentation tasks, supporting each other during the presentation, displaying equal amount of knowledge).
- Explain the role of engineering in their city design.

Guide Students' Thinking

Use these questions to help your students prepare a presentation that meets competition requirements.

1. What is important for people to know about your city (e.g., name, location, features, benefits, how infrastructure works)?
2. What makes your city innovative and futuristic?
3. How is your solution to the Fuel Your Future essay part of your city design?
4. How will you use your physical model to illustrate your city's design and features?
5. What visual aids and props will you use to enhance your presentation?
6. What types of engineering are used in your city?
7. How did you use the engineering design process when planning your city?
8. How can you demonstrate teamwork (e.g., share presentation tasks, support each other during the presentation, display equal amount of knowledge)?
9. How will you practice presenting your ideas and answering questions from the judges?

Tips

Introduce your city using different perspectives—a citizen, tourist, historian, etc. Be creative and have fun introducing your city of the future.

Use visual aids and props. While the model is the primary demonstration aid, students may use pointers, display boards, flip charts, costumes, handouts, and brochures during the presentation. With the exception of handouts and costumes, any visible item that is not part of the Physical Model will be deemed a visual aid and subject to the following size limitations.

Display boards—may consist of either:

- A single display not exceeding 60" (W) x 36" (H) (e.g., a single foam board resting on an easel).

  OR

- Two displays each not exceeding 30" (W) x 36" (H) each (e.g., two flip charts, each on separate easels).

The size does not include the easel or stand. And a team may use multiple display boards on an easel if they do not exceed the maximum dimension when displayed.

Flip Charts—If you are using prepared flip charts, make sure your writing does not show through to the next page. Make your lettering BIG & DARK. (Use blue, black, brown, purple, or dark green markers.)

Costumes—These include anything the presenters wear or carry that enhances the role they are depicting in their presentation (e.g., lab coats, hard hats, team t-shirts, cell phones, briefcases, etc).

Handouts and small mock-ups—All items in this category must collectively fit within a 6" x 6" x 12" volume (e.g., a shoe box).

Brochures—are limited to one 8.5" x 11" sheet of paper.

Stay within the $100 limit. The total value of ALL the materials used in support of the presentation and special awards, including the physical model, may not exceed $100. All materials must be documented on the **Competition Expense Form** found on page 41.

Audiovisual equipment is not allowed. This includes laptop computers, overhead projectors, DVD/video players, iPod, iPad, mp3 players.

Practice, practice, practice. The best presentations have been rehearsed many times. Use these tips to help your students polish their presentation.

- Practice the presentation as a team many times before the competition.
- Time the presentation (no longer than seven minutes) and include the model and all props in the practice sessions.
- Have students take turns as coach and as presenter. This method gives the team an opportunity to incorporate all team members' ideas into the final presentation.
- After each presentation, have peer coaches discuss:
  - ✳ What parts of the presentation were clear and informative?
  - ✳ Were there any points they didn't understand?
  - ✳ What was one thing they liked about how their peers presented?
  - ✳ Did the presenters make eye contact? How was their posture, gestures, tone of voice, or pace of the delivery?
  - ✳ How did the presenters use the model?
- Rehearse the presentation in front of an audience. Your region may ask your students to use a microphone and be on a stage, so practice that too.
- Students should know the material well enough so that they don't have to read notes.
- Have parents or educators act as judges and ask the Sample Judge's Questions.

Check Progress

Use the Sample Judge's Questions to evaluate the presentation. During the presentation, judges will ask two types of questions: (1) Clarifying Questions—questions to help them better understand features of your city and (2) Required Questions—engineer-themed questions that will be asked of all teams.

Sample Judge's Questions are online at **www.futurecity.org** under *Resources*.

Team Presentation Rubric— Have students review the rubric on pages 46 to 47 and evaluate their presentation the same way the judges do.

Competition Checklist

- ◯ Time the presentation to be sure it is no longer than seven minutes. While there is no penalty for taking less time, the more detailed the information students provide, the higher their potential score.
- ◯ Have students think of questions judges might ask and how they might answer them.
- ◯ Relax and have fun. Remind students to think of the presentation as an opportunity to tell their team's story.

Bring the following items to the Regional Competition:

- ◯ The Honor Statement (see page 48).
- ◯ The Media Waiver Form (see page 49).
- ◯ The Competition Expense Form, receipts, and related documentation (see page 41).
- ◯ The Future City Physical Model and Model Identification Card.
- ◯ One copy of the Research Essay and Research Essay Form (see page 30). Check with your Regional Coordinator to see if this is required.
- ◯ One copy of the City Narrative and City Narrative Form (see page 34). Check with your Regional Coordinator to see if this is required.

For submission details and deadlines go to **www.futurecity.org** and click on *Find My Region.*

"The students are so excited about the competition. It's like a science fair elevated. My goal in life is to have every child say that he or she wants to be an engineer."

– Alexis Billingslea, Engineer Mentor, Chicago Region

Competition Scoring

Teams can earn up to 90 points for their Team Presentation. Make sure students have thoroughly covered all three categories to maximize points.

Knowledge	50 points
Delivery/Presentation	30 points
Teamwork	10 points
Total	**90 points**

Scoring Deductions

5 points Teams have a maximum of 7 minutes to make their presentation. Presentations are timed, make sure to practice the timing so your team doesn't get cut off.

15 points Remember there is only a $100 budget for the physical model, presentation materials and special awards combined.

15 points Pay attention to the official presentation dimensions (e.g., display sizes and number).

2 points Don't forget the Honor Statement.

20 points Mind your manners or points will be deducted.

DISQUALIFICATION

Anyone caught destroying another team's model is automatically disqualified.

Team Presentation Rubric

0	2	4	6	8	10
No Points Requirements missing	**Poor** Poor-Fair quality. Fulfills at least 20% of requirements.	**Fair** Fair-Average quality. Fulfills at least 50% of requirements	**Good** Average quality. Fulfills at least 90% of requirements.	**Very Good** Above average quality. Fulfills 100% of requirements.	**Excellent** Excellent quality. Fulfills 100% of requirements. Additional distinctive features.

I. KNOWLEDGE (50 POINTS)	0	2	4	6	8	10
1. Organization • Major elements: Intro, body, and conclusion • Transitions between elements • Logical • Supporting information (definitions, examples, statistics, quotes, etc.)	Poor organization. No transitions. Missing major elements. No supporting information.	Poor organization. Missing a major element. Little support. Few transitions.	Fair organization. Contains most major elements. Some supporting information. Some transitions.	Several futuristic designs. Few plausible.	Many futuristic designs. Most plausible.	Highly futuristic. Very plausible.
2. Presentation Content • City features, benefits, and aesthetics • Geography, demographics or distinctive characteristics • Infrastructure (e.g., transportation, energy, waste disposal or pollution control) • Innovations in technology and futuristic concepts	No city features, geography, infrastructure or innovation mentioned.	Includes a few of the required elements. Poorly discussed. Little explanation or not believable.	Fair description of the city. A few distinctive benefits and innovations explained. Somewhat futuristic and believable.	Good overall description of the city. Several distinctive benefits explained. Some innovations. Somewhat futuristic and believable.	Very good description of city. Many benefits and innovations explained. Futuristic and believable.	Excellent and detailed description of city. Effective description of benefits and high degree of innovation. Futuristic and believable.
3. Essay Topic (alternative energy) • Discusses essay topic: energy source for generating electricity that does not deplete natural resources and has limited environmental impact • Explains how the yearly theme influenced the city design or development	No discussion of electric infrastructure.	Refers to essay topic briefly. Inadequate solution.	Briefly discusses essay topic and solution. No real supporting facts. Explains how their city design incorporates the theme.	Discusses the essay topic and solution. Some supporting facts. Solution is adequate, somewhat innovative. Somewhat explains how their city design incorporates the theme.	Discusses the essay topic and solution. Good supporting facts. Solution innovative or futuristic. Fully explains how their city design incorporates the theme.	Discusses the essay topic and solution with excellent supporting facts. Excellent explanation of how their city design incorporates the theme.
4. Knowledge of Engineering Roles & Design Process • Discusses the engineering field and/or engineering roles • Demonstrates knowledge of engineering design process: problem definition, tradeoffs, testing, etc. • Has applied engineering process to FC project	No discussion of engineering.	Mentions engineering, but lacks understanding of roles or design process.	Briefly discusses and understands engineering and role of engineer. Little discussion of engineering process. No link to project.	Discusses and understands engineering role. Presents some knowledge of engineering process, but no link to FC project.	Good understanding of engineering role. Attempts to explain engineering process as related to part of the project.	Excellent understanding of engineering and engineering process. Applies engineering process throughout the project.
5. Questions and Answers • Answers questions with confidence • Accurate, complete answers	Unable to answer questions.	Answers a few questions accurately. No supporting facts.	Answers at least 50% of the questions accurately. Few supporting facts.	Answers 90% of questions with accuracy and some supporting facts.	Answers 100% of the questions accurately with some supporting detail.	Fully, accurately, and confidently answers all questions with many supporting details.

Team Presentation Rubric

0	2	4	6	8	10
No Points Requirements missing	**Poor** Poor-Fair quality. Fulfills at least 20% of requirements.	**Fair** Fair-Average quality. Fulfills at least 50% of requirements	**Good** Average quality. Fulfills at least 90% of requirements.	**Very Good** Above average quality. Fulfills 100% of requirements.	**Excellent** Excellent quality. Fulfills 100% of requirements. Additional distinctive features.

II. DELIVERY/PRESENTATION SKILLS (30 POINTS)	0	2	4	6	8	10
6. Presentation Skills • Verbal skills: Fluent, clear, audible delivery • Verbal skills: Correct grammar and appropriate language use • Non-verbal skills: Upright posture with practiced use of visual aids • Overall confident, direct, and animated delivery	Poor skills throughout the presentation. All students need improvement in all areas.	A few verbal and nonverbal skills are fairly well done but needs more practice to improve in most areas.	Fair to good skills for the majority of the presenters.	Good verbal and nonverbal skills for most presenters. Somewhat confident and direct.	Very good verbal and nonverbal skills by most of presenters throughout majority of the presentation.	Excellent verbal and nonverbal skills by all presenters throughout the presentation. Very confident, direct, and animated delivery.
7. Model as a Demonstration Aid • Model is a key element of entire delivery • Creatively uses model to illustrate city features • Model enhances, rather than distracts, from presentation	Little or no use of the model as a demonstration aid.	Model referenced but does not enhance presentation.	Model is used and is partially effective at illustrating features. Fairly enhances presentation. Little innovation shown.	Good use of the model as an illustration of city design and function. Little creativity or illustration of innovations.	Very good model use; integrated smoothly into the presentation and helped to illustrate city design, function and innovations.	Extremely creative, integrated use of model; contributed significantly to the understanding of city design, function and innovations.
8. Visual and Other Aids • Visual aids (posters, charts) neat, well-prepared • Additional demonstration aids, if used (props, costumes, handouts, etc.) enhance, rather than distract, from presentation • Delivery with all visual aids is well practiced and confident	No use of visual aids or visual (or other demonstration) aids distract from presentation.	Few visual aids. Poorly designed. Poorly used in presentation.	Fairly well designed visual aids. Fairly well used to enhance presentation.	Good design of visual aids that generally added to presentation. Could be used more effectively.	Many well-designed visual aids. Could be more creative. Well used to enhance the presentation.	Many well designed, constructed and creative visual aids that integrated well into the presentation. Effective use in delivery.
III. TEAMWORK (10 POINTS)	**0**	**2**	**4**	**6**	**8**	**10**
9. Teamwork During Presentation and Q&A • Team members supported each other • Team members shared time equally • Team members displayed an equal amount of knowledge • Full complement of team members (three students)	Little or no collaboration or support among team members.	A small amount of collaboration among team members but more support of one another is needed. One or two tend to dominate during both presentation and Q&A.	Some collaboration, some support and sharing among some team members. Amount of knowledge appears unequal. One or two tend to dominate during either the presentation or Q&A.	Good collaboration; support and sharing among most members. Full complement of three team members. Some team members have more knowledge and dominate.	Very good collaboration, support and sharing among the team members on both Q & A and presentation. Equivalent knowledge level for most of team. Full complement of three team members.	Excellent collaboration, support and sharing among all of the team members throughout. Equivalent knowledge level for all. Full complement of three team members. No one dominates.

Download a writeable PDF version
of this form at **www.futurecity.org/forms.**

Honor Statement

We, the undersigned, do affirm that we have read and complied with the rules of the 2011–2012 National Engineers Week Future City® Competition, and that the work we are presenting is original work done by the students. The Educator and the Engineer Mentor acted only as advisors to the project.

Student Name 1 (Print): _____ Date: _____

Signature: _____

Student Name 2 (Print): _____ Date: _____

Signature: _____

Student Name 3 (Print): _____ Date: _____

Signature: _____

Student Alternate Name (Print): _____ Date: _____

Signature: _____

Educator Name (Print): _____ Date: _____

Signature: _____

Mentor Name (Print): _____ Date: _____

Signature: _____

Download a writeable PDF version
of this form at **www.futurecity.org/forms.**

Media Waiver Form

Please make a copy of this form for all members of the team (3 students, 1 educator, 1 mentor) and any other members of the team who may attend either the Regional or National Finals. All team members must submit a copy of the Media Waiver Form to their Regional Coordinator.

Student Media Waiver

By signing below, we give our consent to National Engineers Week to use the student's name, photograph, and likeness in order to promote the National Engineers Week Future City® Competition. We understand that the student may be called upon by journalists to answer questions about his/her involvement in the National Engineers Week Future City® Competition, and we will also allow the student to speak to any media via phone or television.

Date: FC Region:

Student Name (Please Print):

Guardian Name (One Only):

Guardian Signature:

*Guardian's Email:

City: State: Zip:

*Your email will be added to our database for future evaluation studies. If you'd like to opt-out, please send us an email at: info@futurecity.org

Educator/Mentor Media Waiver

By signing below, I give my consent to National Engineers Week to use my name, photograph and likeness in order to promote the National Engineers Week Future City® Competition. I understand that I may be called upon by journalists to answer questions about my involvement in the National Engineers Week Future City® Competition, and I will also speak to any media via phone or television.

Date: FC Region:

Name (Please Print):

City: State: Zip:

Signature:

Competition Rules

Official Competition Rules

General

1. National Engineers Week Future City® Competition is for 6th, 7th, and 8th grade students only, enrolled in a public, private, parochial, or home school. Students must be from the same school.
2. Schools may register in only one region per year. If they wish to transfer to a different region, they must petition and obtain the approval of the Regional Coordinator and the National Program Manager. Teams must commit to a specific region by October 31, 2011.
3. You may have as many students working on the project as you wish, but only 3 students can represent your educational institution or organization by giving their team's presentation at the Regional and National Final Competition. In addition, there must be 1 educator (any educational professional) and 1 engineer mentor (because of the nature of the competition a mentor from the engineering community is preferred, but a mentor can be anyone involved in a technical profession) for an official team of 5 members.
4. The team members that compete in the National Finals must be the same team members that won the Regional Competition. At the time of registering your team(s) for the Regional Competition, you may select one student that can act as an alternate for both the Regional and National Competitions. The alternate can only be utilized if one of the original three presenters cannot compete due to illness or family emergency. The alternate can only compete upon the approval of the Regional Coordinator and the National Program Manager.
5. At least 20 schools must be registered in a region in order for that region's winner to advance to the National Finals.
6. Home-school parents must submit a home-school affidavit to their Regional Coordinator stating that the students are covering material in the 6th, 7th, & 8th grades.
7. If deadlines are missed at the Regional or National level, points will be deducted from the score.
8. Only one team from each of the top scoring schools can advance to the final round of the Regional Competition.
9. All team members must sign the honor statement and submit it in accordance with the schedule set by the Regional Coordinator.
10. The Judges' decisions are final. Any disputes at the Regional level will be resolved locally. There is no appeal process to the National office. Prizes are non-transferable or exchangeable.

Virtual City Design (SimCity)

11. Students must use the pre-designed medium region available for download at **www.futurecity.org.** The pre-designed medium region must be started fresh each year. Schools are not allowed to use a previous year's virtual city design as their base city. A 15 point penalty will apply if the pre-designed medium starter region is not used.
12. SimCity Cheat Codes are not allowed.

Research Essay and Narrative

13. Students must submit a reference page citing at least 3 sources of information with the essay. (NOTE: Wikipedia cannot be cited as a reference.)
14. The Research Essay maximum word count is 1000 words. Word count does not include the title and reference list, but does include captions of graphics and illustrations. A maximum of 4 graphics/illustrations are allowed. A 10 point penalty will apply if word count exceeds 1000.
15. The City Narrative maximum word count is 500 words not including the title. A 2 point penalty will apply if word count exceeds 500.

Presentation

16. Student presentations may not exceed 7 minutes. When the timer signals time, the team must stop their presentation. Teams who continue will have points deducted. Question and answer sessions immediately follow the presentation will be between 5 to 8 minutes as determined by the Regional Coordinator. During the National Competition, the Q&A session will be 5 minutes.

17. Laptop computers, overhead projectors, and DVD/video players, battery operated audio equipment (MP3 player, Discman, Walkman, I-pods, etc.) may not be used for the presentation.

18. Visual aids, such as flip charts, foam boards, poster boards, etc., must not exceed the following limitations: one visual aid displayed at a time (e.g., a single paper of a flip chart resting on an easel) can be up to 60" (W) x 36" (H), two visual aids displayed concurrently (e.g., two posters each on a separate easel) can be up to 30" (W) x 36" (H). The size limitations do not include easel stands.

19. With the exception of handouts/brochures (limited to one 8.5x11" sheet of paper) and costumes, any other demonstration aids including pointers, small mock-ups, etc. used to assist with the presentation must collectively fit within a 6"x 6"x 12" volume (e.g., a shoe box).

Physical Model

20. Teams must begin with a new model each year and are not allowed to use a previous year's physical model (note: individual materials, including the model's platform, may be reused).

21. No perishable or food items may be used for building materials. Use of live animals is also prohibited. If water is used on the model it must be self-contained or drainable.

22. The physical model must be no larger than 25" (W) x 50" (L) x 20" (H), including all supporting braces, materials hanging below or beyond the tabletop, and all fully extended parts, such as access doors and hinged pullouts. Failure to comply with the physical model dimensions will result in a 15 point penalty.

23. Vertically oriented physical models are not accepted.

24. The physical model must contain one or more moving parts.

25. Any power source must be self-contained, (e.g. a household battery and sample circuit). Uses of electrical wall or floor outlets are not allowed.

26. The total value of the materials used in the physical model, as well as those used in support of the presentation and for special awards (including visual aids, costumes, color copying/printing, and other demonstration aids) may not exceed $100. Failure to comply with valuation of model and support materials will result in a 15 point penalty.

27. All materials used must be listed on the competition expense form and their value documented for both presentation and special awards. This includes donated items at fair market value.

" It is a great opportunity for students, and also for the professionals and teachers who mentor them."

– Vanita Patel, New York City Engineer Mentor

Scoring Deductions

To compete in the Future City Competition teams must complete the five program components and can earn up to 400 points. Judges will evaluate each component (except for the team scored Virtual City Benchmark form) in accordance with the component rubrics. Judges will use the Scoring Deduction Sheet (available for download online) to mark deductions. **Judges decisions are final.** At the Regional Competition the Regional Coordinator has the final word on any dispute. There is no appeals process. At the National Finals the Judges' decisions are final.

Penalty	Item	Description
5–10 pts.	Missing deadline for submission of the Virtual City Design (SimCity) and Virtual City Benchmark Form (pg. 19). Deadline will be set by the Regional Coordinator.	The Virtual City Design and Virtual City Benchmark Form must be received in accordance with the deadlines set by the Regional Coordinator.
15 pts	Pre-designed medium region.	You must use the pre-designed medium region available for download from **www.futurecity.org.**
2 pts.	Virtual City Benchmark Form is incomplete.	A properly filled out Virtual City Benchmark Form must be submitted with the Virtual City Design.
5 pts.	Missing deadline for submission of the Essay. Deadline will be set by the Regional Coordinator.	The Essay must be received in accordance with the deadlines set by the Regional Coordinator.
2 pts.	Essay Form is incomplete or missing.	A properly filled out Essay Form must be attached to the Essay. Follow instructions on the form.
10 pts	Exceeding Essay Word Count.	Maximum of 1000 words.
5 pts.	Missing deadline for submission of the City Narrative. Deadline will be set by the Regional Coordinator.	The City Narrative must be received in accordance with the deadlines set by the Regional Coordinator.
2 pts.	City Narrative Form is incomplete or missing.	A properly filled out City Narrative Form must be attached to the City Narrative. Follow instructions on the form.
2 pts	Exceeding Narrative Word Count.	Maximum of 500 words
15 pts.	Exceeding Physical Model dimensions.	The maximum dimensions of the model are 20" (H) x 50" (L) x 25" (W). Height and width dimensions include all supporting structures, such as braces, and any model materials hanging below the tabletop.
15 pts.	Competition Expense Form is missing.	The Competition Expense Form, with receipts attached to the back, must be brought to the competition.
5 pts.	Receipts missing from back of Competition Expense Form.	Receipts must be attached to the back of the Competition Expense Form. Follow instructions on the form.
15 pts.	Exceeding the $100 limit on the physical model and presentation materials.	The total value of the materials used in the model, as well as those used in support of the presentation and for special awards (including visual aids, costumes, color copying/printing, and other demonstration aids) may not exceed $100.
1–5pts.	Missing all or part of the Model ID card.	The Model ID card should be identified by a 4" x 6" index card with: future city name, organization name, team members' names (3 students, educator, engineer mentor), and scale used.
5 pts.	Exceeding presentation time.	Verbal presentation by team is 5-7 minutes. Presentation cannot exceed 7 minutes.
15 pts.	Exceeding presentation dimensions.	Support materials may consist of either: **1.** A single display not exceeding 60" (W) x 36" (H) *OR;* **2.** Two displays not exceeding 30" (W) x 36" (H) each. (The size does not include the easel stand, if one is used.)
2 points	Missing Honor Statement	
20 points	Unsportsmanlike conduct	Rude behavior or disruption of judging by any team member or guests
Disqualification	Destruction of another team's model or presentation materials	

Prizes and Awards

Future City Competition National Finals

Teams that win their Regional Competition* go on to represent their region at the National Finals. National Finals take place from February 17 to 22, 2012 in Washington, DC. Future City will provide round trip transportation (most economical airfare) and hotel accommodations at the Hyatt Regency Crystal City for the team's three student presenters, educator coach, and mentor, as well as two meals. *NOTE:* Students may share a room with a student from another team or opt to pay for a single room supplement. All other expenses are the responsibility of the team.

Future City Competition National Finals are generously sponsored by Bentley Systems, Inc. and Shell Oil Company.

Regional Prizes and Special Awards

Teams that compete are also eligible for a number of special awards. For a complete list of the prizes and awards offered by your region, visit **www.futurecity.org** and click on *Find My Region.*

National Prizes

The top prize at the National Finals is a trip to U.S. Space Camp™ in Huntsville, AL, awarded by Bentley Systems, Inc. (Trip includes airfare and camp registration.)

The first runner up is awarded a $5,000 prize for the school's technology program, provided by the National Society of Professional Engineers.

The second runner up is awarded a $2,000 prize for the school's technology program, provided by IEEE-USA.

All team members will receive a certificate of participation.

**A region must have registered a minimum of 20 schools by October 31, 2011 to be eligible to send a winning team to the National Finals. Regional eligibility is determined solely by the NEW Future City National Office. Prizes are not transferable or exchangeable. Prizes subject to the discretion of the awarding organization.*

National Special Awards

Special awards are presented by technical societies, corporations, and government entities to recognize students' efforts in specific areas.

Award Name	Award Criteria	Sponsor
Best Use of Aerospace Technology in a Future City	Best Use of Aerospace Technology in a Future City.	**American Institute of Aeronautics and Astronautics (AIAA) National Capital Section (NCS)** The American Institute of Aeronautics and Astronautics is one of the oldest and largest aerospace-related associations. The AIAA has approximately 31,000 members across the nation and around the world. The National Capital Section (NCS), with approximately 3,000 members, is the largest section within AIAA. The mission of the AIAA National Capital Section is to serve the profession, by acting as a catalyst for information flow and creative exchange. AIAA-NCS supports the educational process which promotes future generations of aviation and space professionals by nurturing interest among students. **www.aiaa-ncs.org**
Most Sustainable Food Production System	Design that provides the best sustainable food production system while conserving soil, water and energy.	**American Society of Agricultural and Biological Engineers (ASABE)** The American Society of Agricultural and Biological Engineers is an educational and scientific organization dedicated to the advancement of engineering applicable to agricultural, food, and biological systems. Founded in 1907 and headquartered in St Joseph, Michigan, ASABE comprises 9,000 members in more than 100 countries. Agricultural, Food and Biological Engineers develop efficient and environmentally sensitive methods of producing food, fiber, timber, and renewable energy sources for an ever-increasing world population. **www.asabe.org**
Most Innovative Design of Infrastructure Systems	Design that accommodates the most innovative systems (e.g., transportation, water and wastewater) for a community.	**American Society of Civil Engineers (ASCE)** Founded in 1852, ASCE represents more than 123,000 civil engineers worldwide, and is America's oldest national engineering society. ASCE advances professional knowledge and improves the practice of civil engineering as the lead professional organization serving civil engineers and those in related disciplines. **www.asce.org**

Award Name	Award Criteria	Sponsor
Best Indoor Environment	Indoor environment that encompasses occupant comfort, productivity, energy efficiency or air quality.	**American Society of Heating, Refrigerating and Air-Conditioning Engineers** ASHRAE is an international organization of 50,000 persons with chapters throughout the world. The Society is organized for the sole purpose of advancing the arts and sciences of heating, ventilation, air conditioning and refrigeration for the public's benefit. **www.ashrae.org**
Most Sustainable Buildings	In recognition of energy efficient buildings that minimize their impact on the outdoor environment and provide indoor environmental quality for building occupants.	**American Society of Heating, Refrigerating and Air-Conditioning Engineers** ASHRAE is an international organization of 50,000 persons with chapters throughout the world. The Society is organized for the sole purpose of advancing the arts and sciences of heating, ventilation, air conditioning and refrigeration for the public's benefit. **www.ashrae.org**
Best Futuristic City	Use of futuristic engineering concepts into city's communications, energy, or transportation systems.	**American Society of Mechanical Engineers** Founded in 1880, ASME International is a nonprofit educational and technical organization serving a worldwide membership and sets many industrial and manufacturing standards. **www.asme.org**
Best Use of Innovative Construction Materials and Techniques	• Use of innovative construction materials • Use of innovative construction techniques • Overall construction of design	**American Society for Quality - Design and Construction Division** American Society for Quality - Design and Construction Division (ASQ). The American Society for Quality, a professional association headquartered in Milwaukee, Wisconsin, USA, creates better workplaces and communities worldwide by advancing learning, quality improvement, and knowledge exchange. A world of improvement is available through the American Society for Quality, providing information, contacts, and opportunities to make things better in the workplace, in communities, and in people's lives. **www.asq.org**

CONTINUED ON NEXT PAGE

Award Name	Award Criteria	Sponsor
Best Management of Water Resources	• Efficient design of water treatment and distribution for human consumption, agriculture, industry, recreation, and fire protection • Responsible sewage collection and treatment for environmental protection and community aesthetics • Innovative stormwater collection, treatment, reuse and/or discharge back into the environment	**Bentley Systems, Inc.** Bentley is the global leader dedicated to providing architects, engineers, constructors, and owner-operators with comprehensive software solutions for sustaining infrastructure. Founded in 1984, Bentley has nearly 3,000 colleagues in more than 45 countries, $500 million in annual revenues, and, since 1999, has invested more than $1 billion in research, development, and acquisitions. **www.bentley.com**
The City of the Future that Best Incorporates Cultural and Historical Resources	The City whose design best incorporates historical & cultural sites, buildings, infrastructure and customs.	**Cuban-American Association of Civil Engineers, Inc. (Association of Cuban Civil Engineers in Exile, Inc.)** CAACE is a non-profit corporation and its purpose is to assist members in the maintenance of the highest professional engineering skills and to aid the members in retaining and exercising said skills; to maintain and support the highest principles of professional engineering achievements; and to obtain the advancement of the science and profession of engineering. **www.c-aace.org**
Best Residential Zone	Strategic placement of residential zones that allow maximum return for quality of life issues.	**Chinese Institute of Engineers/USA (CIE-USA)** The Chinese Institute of Engineers CIE-USA is a professional non-profit and non-political organization founded in 1917 in New York by a group of talented and forward-looking Chinese engineers who graduated from American colleges and worked in American railroads and various industries. Chinese-American engineers in the US have played a significant role in the rapid growth of technology and communications throughout the United States. The total membership is around 10,000 nationwide. **www.cie-usa.org**
Best Communications System	Strategic placement of a communications system that is both efficient and accurate.	**IEEE-USA** IEEE-USA advances the public good and promotes the careers and public policy interests of more than 215,000 engineers, scientists and allied professionals who are U.S. members of the IEEE. IEEE-USA is part of the IEEE, the world's largest technical professional society with 375,000 members in 160 countries. **www.ieeeusa.org**

Award Name	Award Criteria	Sponsor
Excellence in Systems Integration	Demonstration of excellence in the design of integrated systems of people, material, information equipment and energy.	**Institute of Industrial Engineers** The Institute of Industrial Engineers (IIE) is the world's largest professional society dedicated solely to the support of the industrial engineering profession and individuals involved with improving quality and productivity. Founded in 1948, IIE is an international, non-profit association that provides leadership for the application, education, training, research, and development of industrial engineering. With more than 15,000 members and 280 chapters worldwide, IIE's primary mission is to meet the ever-changing needs of its membership, which includes undergraduate and graduate students, engineering practitioners and consultants in all industries, engineering managers, and engineers in education, research, and government. **www.iienet.org**
Best Land Surveying Practices	The design that employs the best land surveying practices, taking into consideration the high standards used by surveyors to help protect the public's safety and welfare.	**National Council of Examiners for Engineering and Surveying** The National Council of Examiners for Engineering and Surveying (NCEES) is a national non-profit organization composed of engineering and land surveying licensing boards representing all U.S. states and territories. **www.ncees.org**
Protecting the Public's Safety and Welfare through Competent and Ethical Engineering Practices	Community encouragement and enforcement of engineering practice standards and a code of ethics.	**National Society of Professional Engineers** NSPE is the only engineering society that represents individual engineering professionals and licensed engineers (PEs) across all disciplines by promoting engineering licensure and ethics, enhancing the engineer image, advocating and protecting PEs' legal rights. **www.nspe.org**
Accessible City Award	Most accessible design for people with disabilities, the elderly, and others with mobility impairments. Design that accommodates the most innovative systems (e.g., transportation, public rights of way) for a community.	**Paralyzed Veterans of America** Founded in 1946, Paralyzed Veterans of America is the only congressionally chartered veterans service organization dedicated solely for the benefit and representation of veterans with spinal cord injury or disease. Paralyzed Veterans is a dynamic, broad-based organization with more than 19,000 members in all 50 states, the District of Columbia and Puerto Rico. **www.pva.org**

CONTINUED ON NEXT PAGE

Award Name	Award Criteria	Sponsor
Best Future City Project Plan	Teams should develop a clear statement of what needs to be accomplished on their project, including a list of deliverables. They should also have a project budget and schedule or timeline for the completion of their work. Special consideration will be given to teams that list potential unexpected events/ situations they thought of that might present challenges for their project and what they did to prevent them.	**Project Management Institute** With nearly 220,000 members in more than 150 countries, Project Management Institute (PMI) is the leading membership association for the project management profession. PMI is actively engaged in advocacy for the profession, setting professional standards, conducting research and providing access to a wealth of information and resources. **www.pmi.org**
Best Fire Protection Engineering	Society demands that buildings be free of threat from fire. Fire protection features may include structural fire resistance, detection and suppression systems, egress systems, alerting systems, and limitation of combustibles. The fire protection engineer ensures that these features all work together as a system to combat the single phenomenon – fire.	**Society of Fire Protection Engineers** The Society of Fire Protection Engineers was established in 1950 and incorporated as an independent organization in 1971. It is the professional society representing those practicing the field of fire protection engineering. The purpose of the Society is to advance the science and practice of fire protection engineering and its allied fields, to maintain a high ethical standard among its members and to foster fire protection engineering education. **www.sfpe.org**
Best Transportation System	Creative design of transportation system that allows both mobility and transport of goods and services.	**U.S. Department of Transportation – Federal Highway Administration** U.S. Department of Transportation (DOT) – Federal Highway Administration. DOT is at work building a safe and efficient transportation system for the 21st century – one that is international in reach, intermodal in form, intelligent in character, and inclusive in service. **www.fhwa.dot.gov**

Award Name	Award Criteria	Sponsor
Innovative Solutions for Water and Wastewater Utilities to Reduce Costly Reinvestment in America's Aging Infrastructure	The award is judged using two main criteria: addressing an important challenge within the water and/or wastewater infrastructure related to pipes, plants, pumps, and/or green/natural systems and proposing improvements of water and wastewater infrastructure through sustainable methods.	**Water Environment Federation and ITT Corporation** The Water Environment Federation is a not-for-profit association that provides technical education and training for thousands of water quality professionals who clean water and return it safely to the environment. WEF members have proudly protected public health, served their local communities, and supported clean water worldwide since 1928. **www.wef.org** **www.sjwp.org** ITT Corporation plays an important role in vital markets including water and fluids management, global defense and security, and motion and flow control. Thanks to its talented workforce of nearly 40,200 people, ITT is known for engineering and operational excellence, strong values and leadership, and is building a reputation for product innovation and superior customer satisfaction in each of the markets it serves. **www.itt.com**

futuRe City COMPETITION

Certificate of Participation

in recognition of participation in
the 2011–2012 National Engineers Week
Future City® Competition

national engineers week foundation

futuRe City COMPETITION

Presented to

_____

in recognition of participation in
the 2011–2012 National Engineers Week Future City® Competition

_____ _____

national engineers week foundation

Appendix

National Education Standards

Listed on the following pages is how Future City aligns with the Benchmarks for Science Literacy and the ISTE national standards.

Benchmarks for Science Literacy

The full text of the Project 2061 Benchmarks, maintained by the American Association for the Advancement of Science, can be found at:
www.project2061.org/publications/bsl/online/index.php

National Educational Technology Standards

The International Society for Technology in Education (ISTE), in partnership with organizations and educators across the U.S., has developed standards defining what technological knowledge and skills students should learn. These national standards are coupled with student performance indicators by grade level and appear on pages 65 to 71 of this Future City Competition Handbook. For a complete set of the standards visit www.iste.org

Future City also is aligned with:

Principles and Standards for School Mathematics*
http://standards.nctm.org/document/chapter6/index.htm

National Science Education Standards*
www.nap.edu/readingroom/books/nses/html/

National Standards for Technological Literacy*
www.iteaconnect.org

*Copies of these standards as applied to the Future City Competition may be downloaded at www.futurecity.org.

Benchmarks for Science Literacy Project 2061

	Virtual City	Research Essay	Physical Model	Model Shipping	Oral Presentation
The Nature of Science					
1A The Scientific World View	●	●	●		●
1B Scientific Inquiry	●	●	●	●	
1C The Scientific Enterprise	●	●	●	●	●
The Nature of Mathematics					
2A Patterns and Relationships	●	●	●	●	●
2B Mathematics, Science, and Technology	●	●	●	●	●
2C Mathematical Inquiry	●	●	●	●	●
The Nature of Technology					
3A Technology and Science	●	●	●	●	●
3B Design and Systems	●	●	●	●	●
3C Issues in Technology	●	●	●	●	●
The Physical Setting					
4A The Universe		●	●		●
4B The Earth	●	●	●		●
4C Processes that Shape the Earth	●	●	●		●
4D Structure of Matter		●	●	●	●
4E Motion		●	●		●
4F Forces of Nature	●	●	●		●
The Living Environment					
5A Diversity of Life	●	●	●		●
5B Heredity		●			●
5C Cells		●			●
5D Interdependence of Life	●	●	●		●
5E Flow of Matter and Energy	●	●	●		●
5F Evolution of Life	●	●	●		●
The Human Organism					
6A Human Identity	●	●	●		●
6B Human Development	●	●	●		●
6C Basic Functions	●	●	●		●
6D Learning	●	●	●		●
6E Physical Health	●	●	●		●
6F Mental Heath	●	●	●		●

CONTINUED ON NEXT PAGE

Benchmarks for Science Literacy Project 2061 *Continued*

	Virtual City	Research Essay	Physical Model	Model Shipping	Oral Presentation
Human Society					
7A Cultural Effects on Behavior	●	●	●		●
7B Group Behavior	●	●	●		●
7C Social Change	●	●	●		●
7D Social Trade-Offs	●	●	●		●
7E Political and Economic System	●	●	●		●
7F Social Conflict	●	●	●		●
7G Global Interdependence	●	●	●		●
The Designed World					
8A Agriculture	●	●	●		●
8B Materials and Manufacturing	●	●	●	●	●
8C Energy Sources and Use	●	●	●		●
8D Communication	●	●	●		●
8E Information Processing	●	●	●	●	●
8F Health Technology	●	●	●		●
The Mathematical World					
9A Numbers	●	●	●	●	●
9B Symbolic Relationships	●		●	●	●
9C Shapes	●	●	●	●	●
9D Uncertainty	●	●	●	●	●
9E Reasoning	●	●	●	●	●
Historic Perspective					
10A Displacing the Earth from the Center of the Universe		●	●		●
10B Uniting the Heavens and the Earth	●				
10C Relating Matter & Energy and Time & Space	●	●	●		
10D Extending Time	●				
10E Moving the Continents		●	●		
10F Understanding Fire		●	●		●
10G Splitting the Atom	●		●		●
10H Explaining the Diversity of Life	●	●	●		●
10I Discovering Germs		●	●		●
10J Harnessing Power	●	●	●		●
Common Themes					
11A Systems	●	●	●		●
11B Models	●	●	●		●
11C Constancy and Change	●	●	●		●
11D Scale	●	●	●	●	●

Benchmarks for Science Literacy Project 2061 *Continued*

	Virtual City	Research Essay	Physical Model	Model Shipping	Oral Presentation
Habits of Mind					
12A Values and Attitudes	●	●	●		●
12B Computation and Estimation	●	●	●	●	●
12C Manipulation and Observation	●	●	●	●	●
12D Communications Skills	●	●	●		●
12E Critical-Response Skills	●	●	●	●	●

National Education Technology Standards

Objectives Satisfied by Each Deliverable in the Program

Students will...	Virtual City	Research Essay	Physical Model	Model Shipping	Oral Presentation
1 Basic operations and concept					
Students demonstrate a sound understanding of the nature and operation of technology systems.	●	●	●		●
Students are proficient in the use of technology.	●	●	●	●	●
2 Social, ethical, and human issues					
Students understand the ethical, cultural, and societal issues related to technology.	●	●	●		●
Students practice responsible use of technology systems, information, and software.	●	●	●		●
Students develop positive attitudes toward technology uses that support lifelong learning, collaboration, personal pursuits, and productivity.	●	●	●		●
3 Technology productivity tools					
Students use technology tools to enhance learning, increase productivity, and promote creativity.	●	●	●	●	●
Students use productivity tools to collaborate in constructing technology enhanced modes, prepare publications, and produce other creative works.	●	●	●	●	●
4 Technology communication tools					
Students use telecommunication to collaborate, publish, and interact with peers, experts, and other audiences.	●	●	●		●
Students use a variety of media and formats to communicate information and ideas effectively to multiple audiences.	●	●	●		●
5 Technology research tools					
Students use technology tools to locate, evaluate, and collect information from a variety of sources.		●	●	●	●
Students use technology tools to process data and report results.	●	●	●		●
Students evaluate and select new information resources and technological innovation based on the appropriateness of specific tasks.	●	●	●	●	●

CONTINUED ON NEXT PAGE

National Education Technology Standards *Continued*

Students will...	Virtual City	Research Essay	Physical Model	Model Shipping	Oral Presentation
6 Technology problem-solving and decision-making tools					
Students use technology resources for solving problems and making informed decisions.	●	●	●	●	●
Students employ technology in the development of strategies for solving problems in the real world.	●	●	●	●	●

Performance Indicators For Technology-Literate Students

Prior to completion of grade 8, students will...	Virtual City	Research Essay	Physical Model	Model Shipping	Oral Presentation
1 Apply strategies for identifying and solving routine hardware and software problems that occur during everyday use. (1)	●	●		●	
2 Demonstrate knowledge of current changes in information technologies and the effect those changes have on the workplace and society. (2)	●	●	●	●	●
3 Exhibit legal and ethical behaviors when using information and technology and discuss consequences of misuse. (2)	●	●	●		●
4 Use content-specific tools, software, and simulation (e.g., environmental probes, graphing calculators, exploratory environments, Web tools) to support learning and research. (3,5)	●	●	●		●
5 Apply productivity/multimedia tools and peripherals to support personal productivity, group collaboration, and learning throughout the curriculum (3,6)	●		●		●
6 Design, develop, publish, and present products (e.g. Web pages, videotapes) using technology resources that demonstrate and communicate curriculum concepts to audiences inside and outside the classroom (4,5,6)	●	●	●		●
7 Collaborate with peers, experts, and others using telecommunications and collaborative tools to investigate curriculum-related problems, issues, and information, and to develop solutions or products for audiences inside and outside the classroom (4,5)	●	●	●	●	●
8 Select and use appropriate tools and technology resources to accomplish a variety of tasks and solve problems (5,6)	●	●	●	●	●
9 Demonstrate an understanding of concepts underlying hardware, software, and connectivity, and practical applications of learning and problem solving. (1,6)	●	●	●		●
10 Research and evaluate the accuracy, relevance, appropriateness, comprehensiveness, and bias of electronic information, sources concerning real-world problems (2,5,6)	●	●	●		●

Performance Indicators for Technology-Literate Students *Continued*

Students will...	Virtual City	Research Essay	Physical Model	Model Shipping	Oral Presentation
1 …develop an understanding of the characteristics and scope of technology					
New products and systems can be developed to solve problems or to help do things that could not be done without the help of technology.	●		●	●	
The development of technology is a human activity and is the result of individual or collective needs and the ability to be creative.	●		●	●	
Technology is closely linked to creativity, which has resulted in innovation.			●	●	●
Corporations can often create demand for a product by bringing it into the market and advertising.			●		●
2 …develop an understanding of the core concepts of technology.					
Technological systems include input, processes, output, and, at times, feedback.	●		●	●	
Systems thinking involves considering how every part relates to others.	●	●	●	●	●
An open-loop system has no feedback path and requires human intervention, while a closed-loop system uses feedback.	●	●	●		
Technological systems can be connected to one another.	●	●	●	●	●
Malfunctions of any part of a system may affect the function and quality of the system.	●	●	●		●
Requirements are the parameters placed on the development of a product or system.	●	●	●		
Trade-off is a decision process recognizing the need for careful compromises among competing factors.	●	●	●		●
Different technologies involve different sets of processes.	●	●	●		
Maintenance is the process of inspecting and servicing a product or system on a regular basis in order for it to continue functioning properly, to extend its life, or to upgrade its capability.	●	●	●	●	
Controls are mechanisms or particular steps that people perform using information about the system that causes systems to change.	●				
3 …develop an understanding of the relationships among technologies and the connections between technology and other fields of study.					
Technological systems often interact with one another.	●	●	●		●
A product, system, or environment developed for one setting may be applied to another setting.	●	●	●	●	●
Knowledge gained from other fields of study has a direct effect on the development of technological products and systems.	●	●	●	●	●

CONTINUED ON NEXT PAGE

Performance Indicators for Technology-Literate Students *Continued*

Students will...	Virtual City	Research Essay	Physical Model	Model Shipping	Oral Presentation
4 …develop an understanding of the cultural, social, economic, and political effects of technology.					
The use of technology affects humans in various ways, including their safety comfort, choice and attitudes about technology's development and use.	●	●	●	●	●
Technology, by itself, is neither good nor bad, but decisions about the use of products and systems can result in desirable or undesirable consequences.	●	●	●	●	●
The development and use of technology pose ethical issues.	●	●	●		●
Economic, political, and cultural issues are influenced by the development and use of technology.	●	●	●		●
5 …develop an understanding of the effects of technology on the environment.					
The management of waste produced by technological systems in an important societal issue.	●	●	●	●	●
Technologies can be used to repair damage caused by natural disasters and to breakdown waste from the use of various products and systems.	●	●	●		●
Decisions to develop and use technologies often put environmental and economic concerns in direct competition with one another.	●	●	●	●	●
6 …develop an understanding of the role of society in the development and use of technology.					
Throughout history, new technologies have resulted from the demands, values, and interests of individuals, businesses, industries, and societies.	●	●	●		●
The use of inventions and innovations has led to changes in society and the creation of new needs and wants.	●	●	●		●
Social and cultural priorities and values are reflected in technological devices.	●	●	●		●
Meeting societal expectations is the driving force behind the acceptance and use of products and systems.	●	●	●		●
7 …develop an understanding of the influence of technology on history.					
Many inventions and innovations have evolved by using slow and methodical processes of tests and refinements.	●	●	●		●
The specialization of function has been at the heart of any technological improvements.	●	●	●	●	●
The design and construction of structures for service or convenience have evolved from the development of techniques for measurement, controlling systems, and the understanding of spatial relationships.	●	●	●	●	●
In the past, an invention or innovation was usually developed with the knowledge of science.		●			

Performance Indicators for Technology-Literate Students *Continued*

Students will...	Virtual City	Research Essay	Physical Model	Model Shipping	Oral Presentation
8 …develop an understanding of the attributes of design.					
Design is a creative planning process that leads to useful products and systems.	●		●	●	●
There is no perfect design.	●		●	●	●
Requirements for a design are made up of criteria and constraints.	●		●	●	●
9 …develop an understanding of engineering design.					
Design involves a set of steps, which can be performed in different sequences and repeated as needed.	●		●	●	●
Brainstorming is a group problem-solving design process in which each person in the group presents his or her ideas in an open forum.	●		●	●	●
Modeling, testing, evaluating, and modifying are used to transform ideas into practical solutions.	●		●	●	●
10 …develop an understanding of the role of troubleshooting, research and development, invention and innovation, and experimentation in problem solving.					
Troubleshooting is a problem-solving method used to identify the cause of a malfunction in a technological system.	●		●	●	
Invention is a process of turning ideas and imagination into devices and systems. Innovation is the process of modifying an existing product or system to improve it.	●		●	●	
Some technological problems are best solved through experimentation.	●		●	●	
11 …develop abilities to apply the design processes.					
Apply a design process to problems in and beyond the laboratory-classroom.	●		●	●	●
Specify criteria and constraints for the design.	●		●	●	●
Make two-dimensional and three-dimensional representations of the designed solution.	●	●	●		
Test and evaluate the design in relation to pre-established requirements, such as criteria and constraints, and refine as needed.	●		●	●	
Make a product or system and document the solution.	●	●	●	●	
12 …develop the abilities to use and maintain technological products and systems.					
Use information provided in manuals, protocols, or by experienced people to see and understand how things work.	●	●	●	●	
Use tools, materials, and machines safely to diagnose, adjust, and repair systems.	●	●	●	●	
Use computers and calculators in various applications.	●	●	●	●	
Operate and maintain systems in order to achieve a given purpose.	●		●	●	

CONTINUED ON NEXT PAGE

Performance Indicators for Technology-Literate Students *Continued*

Students will...	Virtual City	Research Essay	Physical Model	Model Shipping	Oral Presentation
13 …develop the abilities to assess the impact of products and systems. Design and use instruments to gather data.					
Design and use instruments to gather data.	●				
Use data collected to analyze and interpret trends in order to identify the positive or negative effects of a technology.	●				
Identify trends and monitor potential consequences of technological development.	●				
Interpret and evaluate the accuracy of the information obtained and determine if it is useful.	●				
14 …develop an understanding of and be able to select and use medical technologies.					
Advances and innovations in medical technologies are used to improve health care.		●	●		●
Sanitation processes used in the disposal of medical products help to protect people from harmful organisms and disease, and shape the ethics of medical safety.		●	●		●
The vaccines developed for immunization use require specialized technologies to support environments in which a sufficient amount of vaccines is produced.		●	●		●
Genetic engineering involves modifying the structure of DNA to produce novel genetic make-ups.		●	●		●
15 …develop an understanding of and be able to select and use agricultural and related biotechnologies.					
Technological advances in agriculture directly affect the time and number of people required to produce food for a large population.	●	●	●		●
A wide range of specialized equipment and practices is used to improve the production of food, fiber, fuel, and other useful products and in the care of animals.		●	●		●
Biotechnology applies the principles of biology to create commercial products or processes.	●	●		●	
Artificial ecosystems are human-made complexes that replicate some aspects of the natural environment.					
The development of refrigeration, freezing, dehydration, preservation, and irradiation provide long-term storage of food and reduce the health risks caused by tainted food.	●	●		●	
16 …develop an understanding of and be able to select and use energy and power technologies.					
Energy is the capacity to work. Energy can be used to do work, using many processes.		●	●		
Power is the rate at which energy is converted from one form to another or transferred from one place to another, or the rate at which work is done.		●	●		
Power systems are used to drive and provide propulsion to other technological products and systems.		●	●		
Much of the energy used in our environment is not used efficiently.	●	●	●		●

Performance Indicators for Technology-Literate Students *Continued*

Students will...	Virtual City	Research Essay	Physical Model	Model Shipping	Oral Presentation
17 …develop an understanding of and be able to select and use information and communication technologies.					
Information and communication systems allow information to be transferred from human to human, human to machine, and machine to human.	●	●	●		●
Communication systems are made up of a source, encoder, transmitter, receiver, decoder, and destination.	●	●	●		●
The design of a message is influenced by such factors as the intended audience, medium, purpose, and nature of the message.	●	●	●		●
The use of symbols, measurements, and drawings promotes clear communication by providing a common language to express ideas.	●	●	●		●
18 …develop an understanding of and be able to select and use transportation technologies.					
Transporting people and goods involves a combination of individuals and vehicles.	●	●	●	●	●
Transportation vehicles are made up of subsystems, such as structural, propulsion, suspension, guidance, control, and support, that must function together for a system to work effectively.	●	●	●	●	●
Governmental regulations often influence the design and operation of transportation systems.	●	●	●	●	●
Processes, such as receiving, holding, storing, loading, moving, unloading, delivering, evaluating, marketing, managing, communicating, and using conventions are necessary for the entire transportation system to operate efficiently.	●	●	●	●	●
19 …develop an understanding of and be able to select and use manufacturing technologies.					
Manufacturing systems use mechanical processes that change the form of materials through the processes of separating, forming, combining, and conditioning them.	●	●	●		●
Manufactured goods may be classified as durable and nondurable.	●	●	●		●
The manufacturing process includes the designing, development, making, and servicing of products and systems.	●	●	●	●	●
Chemical technologies are used to modify or alter chemical substances.	●	●	●		●
Materials must first be located before they can be extracted from the earth through such processes as harvesting, drilling, and mining.	●	●	●		●
Marketing a product involves informing the public about it as well as assisting in selling and distributing it.		●	●	●	●
20 …develop an understanding of and be able to select and use construction technologies.					
The selection of designs for structures is based on factors such as building laws and codes, style, convenience, cost, climate, and function.	●		●	●	●
Structures rest on a foundation.	●		●		●
Some structures are temporary, while others are permanent.	●		●		●
Structures rest on a foundation. Some structures are temporary, while others are permanent. Buildings generally contain a variety of subsystems.	●		●		●

Future City Regional Coordinators

ALABAMA
Sonya Dillard
NASA – Marshall Space Flight Center

ARIZONA
Michael Andrews
Andrews & Associates, LLC

CALIFORNIA (NORTHERN)
Lynda McGhie
Future City Northern California

COLORADO
Byron C. Gray
IBM Global Services

FLORIDA (SOUTH)
Dr. Osama Mohammed
Florida International University

FLORIDA (TAMPA BAY)
Cengiz H. Mumcuoglu
Skanska USA Building Inc.

GEORGIA
Dr. Dawn Ramsey
Southern Polytechnic State University

IDAHO
Lynn Olson, P.E.
Future City Idaho

ILLINOIS (CHICAGO)
Don Wittmer, P.E.
HNTB

INDIANA
Carol Dostal
Indiana University – Purdue University Fort Wayne

IOWA
Jean Oberbroeckling
Future City Iowa

KANSAS (GREAT PLAINS)
Jeff Sims
KDOT Bureau of Design

KENTUCKY
Joe Percefull
Future City Kentucky

MARYLAND
Mark Bodmann, P.E.
Wallace Montgomery

MICHIGAN
Ron N. Smith
The Engineering Society of Detroit

MINNESOTA
Colleen Feller
Success Beyond the Classroom

NEBRASKA (OMAHA / HEARTLAND)
John A. Thomsen
ESU#3 High Ability Learner Advisory Coordinator

NEVADA
Guy Voss, P.E.
Black & Veatch

NEW ENGLAND REGION
Reed Brockman, P.E.
AECOM

NEW JERSEY
Scott Lubarsky, P.E.
Future City New Jersey

NEW YORK (ALBANY)
Jennifer Smith
Future City Albany

NEW YORK (NEW YORK CITY)
Karen Armfield, P.E.
AECOM

NEW YORK (WESTERN)
Karen A. Armstrong
Future City WNY

NORTH CAROLINA
Chris Kreider
North Carolina Department of Transportation

OHIO
Peggy Panagopolous Flaherty
ITT Corporation

OKLAHOMA
Todd Hiemer, P.E.
OG&E Electric Services

PENNSYLVANIA (CENTRAL)
William Sutton
ASCE

PENNSYLVANIA (PHILADELPHIA)
John E. Kampmeyer, P.E., F.NSPE, F.ASHRAE
Triad Fire Protection Engineering Corp.

PENNSYLVANIA (PITTSBURGH)
Carol Schoemer
Carnegie Science Center

SOUTH CAROLINA
Kimberly Mitchell
Savannah River Nuclear Solutions, LLC

TEXAS (CENTRAL)
Dr. Dawn Roberson
University of Texas San Antonio

TEXAS-HOUSTON REGION
Dr. Zafar Taqvi
Future City Houston

TEXAS - NORTH TEXAS
Jean M. Eason
IEEE-USA

VIRGINIA (HAMPTON ROADS)
Selena D. Griffett, P.E.
City of Hampton, Engineering Services

WASHINGTON STATE
Karen Pavletich
Puget Sound Energy

WISCONSIN
Kelly Wesolowski
Engineers & Scientists of Milwaukee, Inc.

Regional Coordinators

The National Future City Staff would like to thank and acknowledge the dedication of our tireless Regional Coordinators and their committee members. The countless hours that they contribute as they answer every question (big and small), match mentors to schools, fundraise, and host wonderful Regional Competitions is the foundation on which Future City rests. Thank you!

To contact your Regional Coordinator visit **www.futurecity.org** and click on *Find My Region*.

Notes

Notes

Notes

CREATE... ENJOY... DESTROY!

SIMCITY™ CREATOR

Create amazing cities from the past, present, and future.

Destroy your city: earthquakes, meteors, giant monsters, and many more epic disasters!

Fly missions in your helicopter, airplane, or other aircraft.

EVERYONE ™

E

Alcohol Reference
Mild Language
Mild Violence
Tobacco Reference

ESRB CONTENT RATING www.esrb.org

© 2008 Electronic Arts Inc. EA, the EA logo, and SimCity are trademarks or registered trademarks of Electronic Arts Inc. in the U.S. and/or other countries. All Rights Reserved. All other trademarks are the property of their respective owners.

Sponsors

We would like to thank our many generous sponsors
for their continued support of the Future City program.

Funding for the Future City National Finals is provided by:

Funding for this year's Future City Essay is provided by:

We would also like to thank Electronic Arts for generously donating the SimCity™ 4 Deluxe Software to Future City each year.

Thank you to Aspyr Media for providing SimCity™ 4 Deluxe for the MAC at a greatly reduced price.

A special thanks to the Chairs of 2012 National Engineers Week.